IBM Cloud Manager with OpenStack

Administrator Guide, version 4.2

IBM Cloud Manager with OpenStack

Administrator Guide, version 4.2

Note

Before using this information and the product it supports, read the information in "Notices" on page 341.

Seventh Edition (December 2014)

Contents

Chapter 1. Overview of IBM Cloud Manager with OpenStack

IBM® Cloud Manager with OpenStack is an easy to deploy, simple to use cloud management software offering that is based on OpenStack with IBM enhancements that feature a self-service portal for workload provisioning, virtual image management, and monitoring. It is an innovative, cost-effective approach that also includes automation, metering, and security for your virtualized environment.

IBM Cloud Manager with OpenStack technical overview

The IBM Cloud Manager with OpenStack solution, provides the architecture, software, and mechanisms that deliver OpenStack clouds to your environment quickly.

By installing the IBM Cloud Manager with OpenStack product, you receive the tools to easily deploy an OpenStack cloud, made up of an OpenStack controller node and one or more compute hosts. There are various topologies that are provided to help you deploy the nodes, which create your cloud.

The general flow for setting up your cloud includes the following steps:

1. Install IBM Cloud Manager with OpenStack on the deployment server.
2. Deploy the cloud topology that includes the controller node and any compute nodes that you want to include.
3. Complete additional configuration steps such as creating initial networks and defining secure access to virtual machines.

After you install and deploy a cloud, the IBM Cloud Manager with OpenStack solution includes the following management tools.

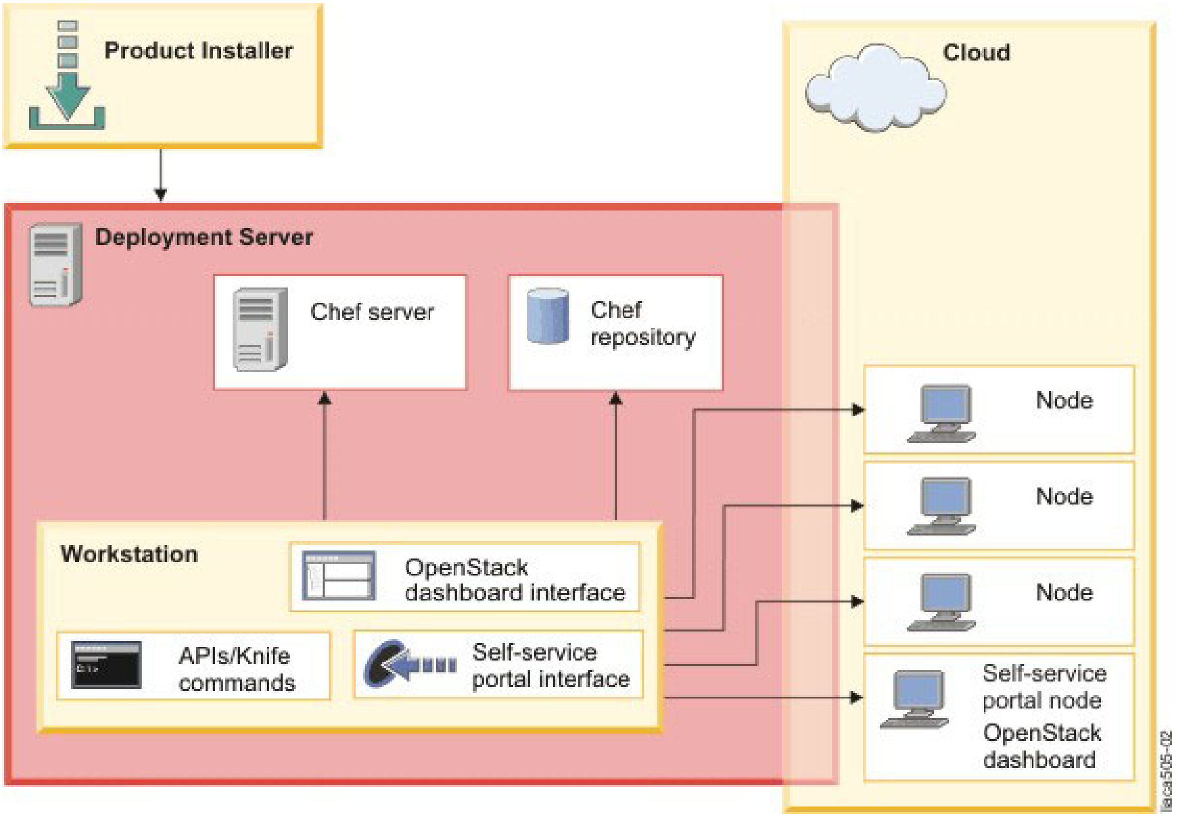
- IBM Cloud Manager with OpenStack **self-service portal**: Optional and intended for management by cloud users.
- OpenStack **dashboard**: Intended for use by cloud administrators.
- **APIs and knife commands**: Intended for cloud administrator use.

You must understand the concepts and terminology of OpenStack and Chef server technology. There is significant documentation that is provided in the community. Review some of the key concepts like *cookbooks*, *recipes*, *environments*, and *roles*. For more information, see the following terminology resources:

- All about Chef ...
- Get started with OpenStack

IBM Cloud Manager with OpenStack is designed to get you started quickly, yet provide you flexibility for production level installations. It uses Chef server technology to provide a robust installation and configuration method by using *cookbooks*, *recipes*, *environments*, and *roles*. Chef provides a client that communicates with the deployment server to install software on remote nodes as well.

This image shows the communication between the IBM Cloud Manager with OpenStack components in your cloud.



The deployment server is where you install the IBM Cloud Manager with OpenStack solution. This server becomes your Chef server and it stores cookbooks and templates (for example) that are applied to nodes. The nodes use the recipes, templates, and file distributions to do as much of the configuration work as possible on the nodes themselves (and not on the Chef server).

For more detail about specific deployment options, see the "Topology overview" on page 69.

Note: You can use the Chef server that is provided with IBM Cloud Manager with OpenStack to upload your own cookbooks, roles, and data bags. These Chef resources can then be used along with the IBM Cloud Manager with OpenStack Chef resources to further customize your cloud deployments. Your customization must be compatible with IBM Cloud Manager with OpenStack.

Related reference:

OpenStack (http://www.openstack.org/)

Chef Overview (http://docs.opscode.com/chef_overview.html)

Self-service management portal (optional)

Easy to deploy and easy to use, IBM Cloud Manager with OpenStack features a self-service portal for performing cloud operations.

With the IBM Cloud Manager with OpenStack self-service portal, you can perform the following public and private cloud operations:

- Provisioning and de-provisioning virtual servers on OpenStack (KVM, PowerKVM, Hyper-V, PowerVC, z/VM®), and VMware vSphere using vCenter virtualization environments
- Providing access to multiple clouds from a single portal
- Drafting and cloning instances

- Capturing instances
- Starting and stopping servers as part of an instance
- Resizing existing virtual machines
- Creating projects to give team-specific access to instances
- Providing network configurations, which set unique network properties to different instances
- Creating expiration polices to reduce abandoned virtual machines
- Providing request and approval workflow support
- Monitoring resource allocations and billing for services

IBM Cloud Manager with OpenStack self-service portal uses the following FIPS 140-2 approved cryptographic providers:

- IBMJCEFIPS (certificate 376)
- IBMJSSEFIPS (certificate 409)
- IBM Crypto for C (certificate 384)

The certificates are listed on the NIST website at http://csrc.nist.gov.

Overview of access-based roles

The IBM Cloud Manager with OpenStack self-service portal supports role-based access control.

Role-based access control is enforced by assigning one or more roles to the user, and allowing each role to perform a given set of operations.

The self-service portal provides the following predefined roles:

User The main responsibility of an end user is to request the provisioning of deployed virtual machines.

- Deploy an image.
- Manage instances.
- View requests.
- View projects.
- View activity reports.

Administrator

Users with this role are responsible for administering all resources in the cloud. The typical tasks of administrators are:

- Configuring the cloud.
- Creating a project, which manages cloud access.
- Manage images.
- Manage instances.
- Manage requests.
- View activity reports.

Content that is specific to one role or the other is designated with the following flags:

- User
- Administrator

Terminology

IBM Cloud Manager with OpenStack supports many different types of virtualization infrastructure environments. These environments sometimes use different terminology for the same concepts.

The terminology differences are described in the following table.

Note: IBM Cloud Manager with OpenStack is aligning more closely with OpenStack terminology. For example, workload and appliance are now referred to as an instance and image. OpenStack is an open source cloud-computing platform for private and public clouds. For information about OpenStack, see http://www.openstack.org/

Table 1. A terminology comparison between the virtualization infrastructure type and the IBM Cloud Manager with OpenStack equivalent term

Virtualization infrastructure type	Term	Definition	IBM Cloud Manager with OpenStack equivalent
VMware	Template	A blueprint of a virtual machine containing the metadata and one or more disk images that can be used to create new virtual machines.	Image
VMware	Virtual machine	A runnable instance of a virtual computer, similar to a physical computer that runs an operating system and applications.	Instance
OpenStack	Flavor	A flavor is a defined size for a provisioned virtual machine. Each flavor has a unique combination of resource configurations and sizes.	Flavor

In addition to terminology differences between environments, there are key concepts that you must understand, if you use the self-service portal.

Projects
Projects, within the self-service portal, provide a management realm to group images and instances that only the members of that project can see and manage.

Requests
Requests are any actions that require administrator approval before they can complete. The self-service portal sends an approval request when a user attempts an operation that an administrator has set up to require approvals.

Accounts
Enabling the billing operation in the self-service portal activates the account feature. An account includes a balance, an owner, an account balance threshold, account members, and invoices. The account members are charged for the instances that they deploy.

Note: Only administrators can create accounts, but a user can be assigned as an account owner.

Basic and advanced deployments
Users deploy an image by using the basic deployment form. Project owners or administrators can use the basic or the advanced deployment forms. They can also configure which deployment settings are shown on the basic deployment form.

What's new in IBM Cloud Manager with OpenStack

IBM Cloud Manager with OpenStack is a cloud solution with new features and support in this release.

The new features include the following:

- A new, simplified command line method for deploying clouds in the KVM or QEMU, PowerKVM, PowerVC environments. With this option of deploying clouds you use an example cloud file that is configured with typical defaults. You can customize the example cloud file as needed to meet your needs. For more information, see “Deploying a prescribed configuration with KVM or QEMU compute nodes” on page 79, “Deploying a prescribed configuration with PowerKVM compute nodes” on page 86, and “Deploying a prescribed configuration to manage to PowerVC” on page 98.
- Enhanced planning worksheets to help you get started. For more information see, “Planning worksheets: Deploying a cloud” on page 18
- IBM Cloud Manager with OpenStack features an enhanced OpenStack compute scheduler, IBM Platform Resource Scheduler. For more information about Platform Resource Scheduler, see Platform Resource Scheduler. The Getting Started section provides more information about What's New and Known Issues in Platform Resource Scheduler.
- Ability to upgrade the IBM Cloud Manager with OpenStack environment from version 4.1 to version 4.2. For more information see, Chapter 4, “Upgrading IBM Cloud Manager with OpenStack,” on page 45.
- Support for configuring your cloud topology to be compliant with the Federal Information Processing Standards (FIPS) for cryptography modules. For more information, see “Customizing for a FIPS-compliant topology” on page 116.

New support includes:

- IBM Cloud Manager with OpenStack version 4.2 is based on the Juno OpenStack release.
  - Support for APIs for the newly integrated OpenStack projects - Sahara and Trove.
  - Support across all OpenStack Juno APIs.
  - Integrated support for load balancer as a service.
  - RabbitMQ support for messaging queue.
- Added support for PowerVC 1.2.2, with new features that include:
  - Using maintenance mode to enable or disable a host system for maintenance.
  - Using the **`Attach interfaces (os-interface)`** Nova API service to create, list, get details for, and delete port interfaces.
  - Allocating a floating IP address to an OpenStack instance. For more information, see Allocating a floating IP address to an instance (OpenStack) and “Managing external networks and floating IP addresses” on page 243.
- Added support for PowerKVM 2.1.1 with GRE network type support. For more information, see “Importing images (OpenStack only)” on page 214.
- Added support VXLAN network type support. For more information, see “Network considerations” on page 16.
- Updated browser support. For more information, see “Supported IBM Cloud Manager with OpenStack web browsers” on page 9.

For information on the latest OpenStack release, see the OpenStack (Juno) Release Notes.

Technical preview features include the following support:

- IBM Cloud Manager with OpenStack version 4.2 includes a technical preview of a disaster recovery service that enables disaster recovery for OpenStack workloads. For more information, see Disaster Recovery Technical Preview Documentation.

License information

Learn about license information for the IBM Cloud Manager with OpenStack product.

The IBM Cloud Manager with OpenStack product includes a default trial license, with a 90-day trial period. You can use this license to investigate IBM Cloud Manager with OpenStack. However, to have full use of IBM Cloud Manager with OpenStack, you need to update the trial license to a permanent license.

Licenses may be required for multiple systems:

- If you install IBM Cloud Manager with OpenStack on an IBM Power® system or x86 system, licenses are required for each socket on the system that is running IBM Cloud Manager with OpenStack. Licenses are also required for each socket on a system that is being managed by IBM Cloud Manager with OpenStack.
- If you install IBM Cloud Manager with OpenStack on a System z® system, or are managing a System z system with IBM Cloud Manager with OpenStack, a managed engine license is required for each System z engine that is running the program or being managed by the program.

For more information, see the license agreement.

To display the current license of IBM Cloud Manager with OpenStack, run the following command:

```
/opt/ibm/cmwo/bin/cmwo_lic.sh
```

Accessibility

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

IBM® strives to provide products with usable access for everyone, regardless of age or ability. This product uses standard browser navigation keys.

The following list includes the major accessibility features in IBM Cloud Manager with OpenStack:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

The IBM Cloud Manager with OpenStack Information Center, and its related publications, are accessibility-enabled.

Keyboard navigation

The product use standard browser navigation keys.

IBM and accessibility

See the IBM Human Ability and Accessibility Center for more information about the commitment that IBM has to accessibility.

Chapter 2. Planning for IBM Cloud Manager with OpenStack

Review the following information for planning to install and using IBM Cloud Manager with OpenStack. The information includes hardware and software requirements for the various IBM Cloud Manager with OpenStack components.

IBM Cloud Manager with OpenStack prerequisites

Review the following information for planning to install and using IBM Cloud Manager with OpenStack.

The information includes hardware and software requirements for the various IBM Cloud Manager with OpenStack components.

IBM Cloud Manager with OpenStack hardware prerequisites

This section describes hardware prerequisites for various platforms and components that IBM Cloud Manager with OpenStack supports.

The information provided is a general guideline and actual requirements can vary from installation to installation. Specific sizings should be done to meet your installation requirements.

The IBM Cloud Manager with OpenStack server is supported on the following platforms:

- Intel x86-64 (Linux)
- POWER6®, POWER7®, or POWER8™ (PowerLinux™)
- z/VM systems (IBM z/Architecture®)

This table describes both the minimum hardware requirements and recommended minimum production hardware requirements for the IBM Cloud Manager with OpenStack deployment server, controller, database, and compute node components.

The minimum requirements listed indicate the absolute minimum hardware levels needed when running with only 5-10 concurrent users.

The recommended minimum production requirements are recommendations to support a small cloud. As with any software solution, hardware needs to be properly sized for a specific customer scenario.

Table 2. Minimum hardware requirements

Component	Minimum hardware requirements	Recommended minimum hardware production requirements
IBM Cloud Manager with OpenStack deployment server [1]	• 4 CPUs • Free disk space: 4 GB for `/opt/ibm/cmwo` • Free disk space: 4.5 GB of temporary space while installing • Chef server: 5.0 GB of free disk space in `/opt`; 5.0 GB of free disk space in `/var`. • 4 GB physical memory	• 8 CPUs • 25 GB free disk space • 8 GB physical memory

Table 2. Minimum hardware requirements (continued)

Component	Minimum hardware requirements	Recommended minimum hardware production requirements
OpenStack controller	• 4 CPUs • 16 GB physical memory • 6 GB free disk space for installed code and empty databases • 1 network interface card	• 4 CPUs • 16 GB physical memory • 6 GB free disk space for installed code and empty databases (4 GB for DB2® and databases) • 3 network interface cards
Standalone DB2	4 GB for DB2 and empty databases	4 GB for DB2 and empty databases
Compute nodes	The following compute nodes are installed from IBM Cloud Manager with OpenStack. For specific requirements, see information about the applicable virtualization environment. • "KVM or QEMU prerequisites" on page 11 • "PowerKVM prerequisites" on page 12 • "Microsoft Hyper-V prerequisites" on page 10 • "z/VM prerequisites" on page 14 Other supported virtualization environments: • "IBM Power Virtualization Center prerequisites" on page 12 • "VMware prerequisites" on page 12	
[1]Requirements are for the IBM Cloud Manager with OpenStack deployment server only (for example, Chef server). If other servers are installed on the same system, the requirements would need to be higher to account for the additional needs of the other components installed and running there.		

IBM Cloud Manager with OpenStack operating system and software prerequisites

This section lists the software prerequisites for IBM Cloud Manager with OpenStack.

The software versions listed are current at the time of publication. See the IBM Cloud Manager with OpenStack wiki for any updates.

Supported IBM Cloud Manager with OpenStack operating systems

This section lists the operating systems and versions that IBM Cloud Manager with OpenStack supports.

The following table lists the operating systems that are supported by the IBM Cloud Manager with OpenStack server, controller, and stand-alone DB2 nodes.

Table 3. Supported operating systems

Operating system	Versions	Notes
Red Hat Enterprise Linux	Version 6.5 (64-bit)	With latest fix pack

Table 3. Supported operating systems (continued)

Operating system	Versions	Notes
z/VM	Version 6.3	For more information, see "z/VM prerequisites" on page 14.

Note: If you use the GNOME Desktop Environment (gnote) or KDE Desktop Environment, some package conflicts might exist with IBM Cloud Manager with OpenStack. For more information about resolving the package conflicts, see "Error occurs when installing qpid" on page 324.

Supported IBM Cloud Manager with OpenStack databases

This sections lists the database and versions that IBM Cloud Manager with OpenStack supports.

The following table lists the databases that are supported by the IBM Cloud Manager with OpenStack server.

Table 4. Supported databases

Database	Versions	Notes
DB2	10.5	With service pack 3
MySQL	5.1.x	For Red Hat Enterprise Linux version 6.5 on x86 systems

Supported messaging services

This section lists the messaging services and versions that IBM Cloud Manager with OpenStack supports.

The following table lists the messaging services that are supported by the IBM Cloud Manager with OpenStack server.

Table 5. Supported messaging services

Messaging service	Versions	Notes
RabbitMQ (default)	3.3.x	For Red Hat Enterprise Linux version 6.5 on x86 systems
Qpid	0.30	For Red Hat Enterprise Linux version 6.5 on x86 systems

Supported IBM Cloud Manager with OpenStack web browsers

This section lists the web browsers and versions that the IBM Cloud Manager with OpenStack self-service portal supports.

The following table lists the web browsers that are supported for clients that access the IBM Cloud Manager with OpenStack servers.

Note: Web browsers or versions that are not listed here might also work.

Table 6. Web browser compatibility

Browser	Versions	Notes
Internet Explorer	11.0	With latest fix pack Minimum resolution of 1024x768 (or greater) Internet Explorer 9 or 10 compatibility view is not supported
Firefox	31	With latest fix pack Minimum resolution of 1024x768 (or greater)
Chrome	38	With latest fix pack
Safari	7	With latest fix pack

Supported IBM Cloud Manager with OpenStack user registries

Review the user registries that are supported by the IBM Cloud Manager with OpenStack server.

The following table lists the user registries that are supported by the IBM Cloud Manager with OpenStack server.

Table 7. Supported user registries

User registry	Versions	Notes
IBM Cloud Manager with OpenStack	Local identity storage and authentication	• The IBM Cloud Manager with OpenStack database is used to store identity artifacts including credentials. • Intended for small-scale usage, such as proof-of-concept scenarios, demonstrations, or environments with up to 30 users and projects
Lightweight Directory Access Protocol (LDAP) Version 3	IBM Tivoli® Directory Server Version 6.1	• Intended for production environments to provide the highest level of security. • Scales to hundreds or thousands of users and projects. • Supports TLS (transaction level security).
	Microsoft Active Directory 6.1.7600.16385	
	OpenLDAP Version 2.4.x	

IBM Cloud Manager with OpenStack virtualization environment prerequisites

IBM Cloud Manager with OpenStack depends on one of several providers for platform management and virtualization services. These providers have unique software prerequisites that depend on the type of cloud provider that you use.

Microsoft Hyper-V prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with Microsoft Hyper-V.

IBM Cloud Manager with OpenStack is compatible with the following versions of these products:

Table 8. Supported Microsoft Hyper-V products

Microsoft Hyper-V products	Versions
Microsoft Hyper-V Server 2012 R2 [1]	
Windows Server 2012 R2 with Hyper-V role enabled	• Standard Edition • Datacenter edition
1. Microsoft Hyper-V Server 2012 R2 does not provide the APIs that are needed for IBM Cloud Manager with OpenStack to create the ISO image file that provides customization data to virtual machines. To useMicrosoft Hyper-V Server 2012 R2 with IBM Cloud Manager with OpenStack, you must install a compatible ISO generation utility such as genisoimage from Cygwin. For more information, see “Enabling Microsoft Hyper-V Server 2012 R2 systems for ISO generation.”	

Note: All operating systems must have the latest fix pack applied.

The management of Microsoft Hyper-V hypervisor is outside the scope of this document. Refer to the product documentation for troubleshooting instructions.

Enabling Microsoft Hyper-V Server 2012 R2 systems for ISO generation

If you are using Microsoft Hyper-V Server 2012 R2 with IBM Cloud Manager with OpenStack, you must install a compatible ISO generation utility such as genisoimage from Cygwin. After you install a compatible ISO generation utility such as genisoimage from Cygwin to use on Microsoft Hyper-V Server 2012 R2 systems, you must update the `nova.conf` file on each system where you installed the IBM Cloud Manager with OpenStack Hyper-V Agent.

Procedure

1. Use a text editor to edit the `nova.conf` file that is located at `C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\etc\nova`.
2. Find the line `mkisofs_cmd=C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\bin\ibmgenisoimage.exe` and change the path and file name of the **`mkisofs_cmd`** property to the ISO generation utility that you installed. For example: mkisofs_cmd=C:\cygwin\bin\genisoimage.exe
3. Restart the IBM Cloud Manager with OpenStack Hyper-V Compute Agent Service by running the following commands:
   - net stop “IBM Cloud Manager with OpenStack Hyper-V Compute Agent Service”
   - net start “IBM Cloud Manager with OpenStack Hyper-V Compute Agent Service”

KVM or QEMU prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with KVM or QEMU.

The KVM or QEMU host must satisfy the following requirements:

- Red Hat Enterprise Linux 6.5
- A libvirt version 0.9.11 or later
- Open vSwitch version 2.0
- Python version 2.6.x.

Certify that the KVM or QEMU host device drivers work with Open vSwitch and update the host device drivers to the latest level. IBM testing with Red Hat Enterprise Linux 6.5 on an IBM PureFlex™ system required that the following device drivers be updated:

kmod-be2iscsi-4.6.267.4-1.x86_64
kmod-tg3-3.129d-1.x86_64
kmod-elx-lpfc-8.3.7.29-1.x86_64
kmod-be2net-4.6.267.4-1.x86_64
kmod-brocade-bfa-3.2.1.1-0.x86_64

kmod-qlgc-qla2xxx-8.04.00.12.06.0_k3-1.x86_64

Updated IBM device drivers are available on the following IBM Support website:

http://ibm.com/support

PowerKVM prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with PowerKVM.

IBM Cloud Manager with OpenStack supports IBM PowerKVM compute nodes. PowerKVM compute nodes must be hosts; nested virtual machines are not supported.

The PowerKVM host must satisfy the following requirements:

- Operating system: IBM_PowerKVM release 2.1.0 and 2.1.1
- Hardware: Power8 Server with the PowerKVM hypervisor configured.

IBM Power Virtualization Center prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with IBM Power Virtualization Center.

IBM Cloud Manager with OpenStack is compatible with IBM Power Virtualization Center Standard version 1.2.0.1, 1.2.0.2, and 1.2.x, a comprehensive virtualization management tool for the PowerVM® platform. To take advantage of the latest features of IBM Power Virtualization Center Standard, version 1.2.2 is required.

IBM Cloud Manager with OpenStack along with PowerVC provides the following capabilities:

- Support for IBM Power Systems™ hosts that are managed by Hardware Management Console.
- Support for storage area networks.
- Support for multiple Virtual I/O Server virtual machines on each host.
- Support for multiple storage connectivity groups, which enable you to deploy images so that they have access to storage that is dedicated to a particular purpose. For more information on PowerVC and storage connectivity groups, refer to the IBM PowerVC documentation.

Limitations for PowerVC support from IBM Cloud Manager with OpenStack:

- PowerVC Express® Edition is not supported.
- Image capture is not supported for any existing virtual machines that are added to PowerVC by using the Manage Existing function.
- Restarting and config drive are not supported for PowerVC 1.2.0.1 or 1.2.0.2.

For information about IBM Power Virtualization Center Standard, including hardware and software requirements and supported guest operating systems, see the IBM Power Virtualization Center information center at the following website.

http://www.ibm.com/support/knowledgecenter/SSXK2N/welcome

Note: IBM Cloud Manager with OpenStack supports managing a PowerVM environment only through PowerVC. If you want to manage a PowerKVM environment, you can use IBM Cloud Manager with OpenStack to manage PowerKVM directly. For more information, see "PowerKVM prerequisites."

VMware prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with VMware.

IBM Cloud Manager with OpenStack is compatible with the following versions of VMware products:

Table 9. Supported VMware products

VMware products	Versions
VMware vCenter Server 4	Standard edition (version 4.1 update 1) Essentials (version 4.1 update 1)
VMware vCenter Server 5	Standard edition Essentials edition Editions that are listed support the following versions: • 5.1.0 • 5.1 update 1 • 5.5
VMware vSphere 4	Standard edition (version 4.1 update 1) Advanced edition (version 4.1 update 1) Enterprise edition (version 4.1 update 1) Essentials Plus (version 4.1 update 1)
VMware vSphere 5	Standard edition Essentials Plus edition Enterprise edition Enterprise Plus edition Editions that are listed support the following versions: • 5.0.0 • 5.1 • 5.1 update 1 • 5.5

IBM Cloud Manager with OpenStack is compatible with existing installations of VMware vSphere managed by VMware vCenter. Ensure that the VMware vCenter Server product is installed, operational, and managing a VMware vSphere environment.

The configuration of the VMware products is outside the scope of this document. Refer to the product documentation for configuration and troubleshooting instructions.

Links

- VMware vCenter Server website at http://www.vmware.com/products/vcenter-server/overview.html.
- VMware vSphere website at http://www.vmware.com/products/vsphere/overview.html.
- VMware Documentation website at http://www.vmware.com/support/pubs/

IBM Cloud Manager with OpenStack supports only Windows and Linux guest operating systems, which are supported by vCenter and ESXi and allow guest customizations. For more information, see the following resources:

- VMware Compatibility Guide for Guest Operating Systems
- Guest OS Customization Support Matrix

Customization of certain Microsoft Windows operating systems requires Microsoft Sysprep Tools. See the information for your version of vCenter for detailed instructions about obtaining the Sysprep Tools and where to store the tools on the vCenter Servers file systems.

Configuration considerations for VMware

- Use DRS-enabled clusters for advanced placement

  Allow vCenter to place the user workload on the best host machine by using a DRS-enabled cluster within vCenter and setting the appliance target to use the cluster or a resource pool that is defined in the cluster. This allows vCenter to manage the available host resources. Otherwise, the appliance target is an individual host machine or a resource pool on a host machine.
- Place vCenter server and IBM Cloud Manager with OpenStack self-service portal on the same network.

  For best performance, it is recommended the vCenter server and the IBM Cloud Manager with OpenStack self-service portal are on the same network.

z/VM prerequisites

View the prerequisites for using IBM Cloud Manager with OpenStack with z/VM.

IBM Cloud Manager with OpenStack is compatible with z/VM version 6.3, which is a comprehensive virtualization management tool for the System z platform.

IBM Cloud Manager with OpenStack with z/VM provides the following capabilities:

- Support for IBM System z hosts that are managed by Extreme Cloud Administration Toolkit.
- Support for storage area networks.
- Support for multiple virtual machines on each host.
- Support for configuring a z/VM node as a controller node or a compute node.

For more information about enabling z/VM for OpenStack and for information about deploying the z/VM appliance to manage from the z/VM environment, see Enabling z/VM for OpenStack. To deploy the z/VM appliance and manage from the z/VM environment, you must install the required prerequisite PTFs. For more information about the PTFs, see the Service Information related to IBM Cloud Manager with OpenStack for System z.

Ensure that z/VM 6.3 and Extreme Cloud Administration Toolkit (xCAT) are configured correctly and working well.

The configuration of z/VM and xCAT is outside the scope of this document. Refer to the following product documentation for configuration and troubleshooting information:

- z/VM 6.3 web site:

  http://www.vm.ibm.com/zvm630/
- z/VM 6.3 product information in IBM Knowledge Center:

  http://www.ibm.com/support/knowledgecenter/SSB27U_6.3.0/com.ibm.zvm.v630/zvminfoc03.htm?lang=en
- z/VM Systems Management Application Programming Guide, version 6.3http://www.vm.ibm.com/library/hcsl8c20.pdf

Supported IBM Cloud Manager with OpenStack support matrix

The following information describes the OpenStack configurations that are supported through the IBM Cloud Manager with OpenStack.

Table 10. IBM Cloud Manager with OpenStack support matrix

Controller node	Compute (Nova)	Scheduler	Filter-scheduler IBM Platform Resource Scheduler
		Nova -network	Not supported, use Neutron
		quota_driver	nova.quota.DbQuotaDriver (default)
			nova.quota.NoopQuotaDriver
	Network (Neutron)	IP version	IPv4
			IPv4/IPv6 dual (not supported by the PowerVC driver)
		Network type	• Flat • GRE (one compute hypervisor must be KVM or PowerKVM) • VXLAN (one compute hypervisor must be KVM) • VLAN
		Virtual switch	Open vSwitch 2.0
		Plug-in	Ml2Plugin (default) OVSNeutronPluginV2
		IP address assignment for deployed instances	DHCP - provided by Neutron DHCP agent / dnsmasq service. Not supported on PowerVC Static - provided to instance by config_drive. Metadata service not supported. L3 agent or floating - Enabled by default in the example environments
		Security groups	Default neutron security groups do not allow ICMP or SSH into deployed instance.
	Storage (Cinder)	Driver	cinder.volume.drivers.ibm.storwize_svc.StorwizeSVCDriver to SAN Volume Controller 6.4.1/6.4.2 for iSCSI and Fibre Channel
			cinder.volume.drivers.LVMVolumeDriver on Red Hat Enterprise Linux version 6.4 or 6.5 for iSCSI
			cinder.volume.drivers.ibm.ibmnas.IBMNAS_NFSDriver for SONAS and IBM Storwize® V7000 Unified
			cinder.volume.drivers.ibm.gpfs.GPFSDriver
			powervc.volume.driver.powervc.PowerVCDriver
	Authentication (Keystone)	Identity backend	keystone.identity.backends.sql.Identity
			keystone.identity.backends.ldap.Identity
		Token format	UUID
			PKI
	Image (Glance)	Image activation	config drive+cloud init (guest operating system: Linux or Windows)
			config drive+VSAE (guest operating system: Linux or Windows)
			config drive+sysprep (guest operating system: Windows)
			ovf+VSAE (for PowerVC)
	Others	Operating System	Red Hat Enterprise Linux version 6.5 z/VM version 6.3
		Database	DB2 version 10.5 SP3
		Queue	Qpid 0.26 Transient in memory rabbitmq-server 3.3.4 Transient in memory

Table 10. IBM Cloud Manager with OpenStack support matrix (continued)

Compute node	Hypervisor	Type	KVM in Red Hat Enterprise Linux version 6.5
			Hyper-V in Microsoft Hyper-V Server 2012 R2, or Microsoft Windows Server 2012 Standard, 2012 data center, 2012 R2 Standard, 2012 R2 data center
			PowerKVM 2.1
			PowerVC in Red Hat Enterprise Linux version 6.5
		Driver	KVM: Nova.virt.libvirt.LibvirtDriver
			Hyper-V: Nova.virt.hyperv.HyperVDriver
			PowerVC: powervc.nova.driver.virt.powervc.driver.PowerVCDriver
			z/VM: nova.virt.zvm.ZVMDriver
	Network (Neutron)	Agent	KVM: OVSNeutronAgent
			Hyper-V: HyperVNeutronAgent
			PowerKVM: OVSNeutronAgent
			PowerVC: PowerVCNeutronAgent (Running on controller node)

Network considerations

Consider the following information before you deploy your cloud environment.

There are a number of factors to consider when you decide which network type is applicable. If you require a web interface for managing network aspects of your environment, you must consider the following web interface support:

Table 11. Web interface management capabilities

Web interface	Network types
Self-service portal	VLAN, Flat, GRE (management only), VXLAN (management only), and DHCP
Dashboard (based on Horizon)	VLAN, Flat, GRE, VXLAN, and DHCP

The network type that you can define is also limited by your network configuration and the type of hypervisor on the nodes in your environment.

Table 12. Supported network configuration

Hypervisor type	Number of network interface cards per node	Network type
Hyper-V	Two[1]	VLAN[2] or Flat

Table 12. Supported network configuration (continued)

Hypervisor type	Number of network interface cards per node	Network type
KVM	One	• Local • GRE[3] • VXLAN
	Two[1]	• Local • GRE[3] • Flat • VLAN[2] • VXLAN
	Three	• Local • GRE[3] • Flat • VLAN[2] • VXLAN
PowerKVM	One	GRE
	Two[1]	• GRE • VLAN[2] • Flat
PowerVC	Two[1]	VLAN **Note:** PowerVC can be configured without a virtual machine data network (only a single network card). DHCP is not supported.
z/VM	Two[1]	VLAN[2] or Flat

- [1]
  - Management network = Defaults to *eth0*. It is used for OpenStack communication between nodes.
  - Virtual machine data network = Defaults to *eth1* (optional). It is used for virtual machine data communication within the cloud environment and is only required if you are using VLAN or Flat networks. Do not use a management or external network as the virtual machine data network.
  - External network L3 network = Defaults to *eth0*. It can be shared with the management network, which is the default configuration.
    Note: Using a shared network interface card might only be appropriate for testing purposes though.

  The environment must have a gateway set in the public network interface configuration files or `/etc/sysconfig/network`. A default gateway is required.

  In the example environments, the GRE and VXLAN networks are configured to use the management network *eth0*. The environment can be updated to allow GRE and VXLAN networks to use the virtual machine data network as well.
- [2] DHCP can be configured with GRE, VXLAN, and flat networks. If using a VLAN network with DHCP, ensure that the single controller is running on dedicated physical hardware, instead of a virtual machine.
- [3] If one or more of the compute hypervisors is not KVM, then GRE and VXLAN cannot be used.

Note:

- The `local` network type can be configured; however, the network traffic is limited to the current node. The minimum topology uses the `local` network option, by default.

Scalability and performance considerations

IBM Cloud Manager with OpenStack offers considerations with regard to scalability and performance within the cloud environment.

Server and concurrent user maximums

IBM Cloud Manager with OpenStack allows management of a configurable number of OpenStack compute nodes from one OpenStack controller node and self-service portal interface.

Depending on your cloud target, IBM Cloud Manager with OpenStack supports a different number of users and server instances in the environment. The number of concurrent servers that are supported per OpenStack compute node is highly variable based on the hardware configuration of the host and the resource consumption of the workload being deployed.

The following data represents the maximum scale with which this framework was tested.

Table 13. Server and concurrent user maximums for IBM Cloud Manager with OpenStack

Concurrent users	**Concurrent instances**	**Compute nodes**
50	1250	11
Environment specifications where testing was completed: • Controller +*n* compute topology with distributed database • Red Hat Enterprise Linux 6.5 guest image using 2048 MB of memory and 20 GB of disk space • Red Hat Enterprise Linux 6.5 x86 KVM hosts		

The VMware cloud manager allows management of one vCenter without the use of OpenStack, from the self-service portal interface. The following data represents the maximum scale with which this framework was tested.

Table 14. Server and concurrent user maximums for VMware cloud manager

Concurrent users	**Concurrent instances**
50	3000
For more information about VMware configuration maximums, see the following information: • VMware configuration maximums (v4) PDF at http://www.vmware.com/pdf/vsphere4/r40/vsp_40_config_max.pdf • VMware configuration maximums (v5) PDF at http://www.vmware.com/pdf/vsphere5/r50/vsphere-50-configuration-maximums.pdf • VMware configuration maximums (v5.5) PDF at http://www.vmware.com/pdf/vsphere5/r55/vsphere-55-configuration-maximums.pdf	

Minimum requirements for large-scale PowerVC environment

When you plan to run a large-scale IBM Power Virtualization Center environment with up to 2,000 workloads, ensure that you adhere to the following guidelines.

Controller node minimum requirements in a large-scale PowerVC environment

- CPU: 16
- Memory: 150 GB
- Disk: 50 GB

Planning worksheets: Deploying a cloud

Use these worksheets to review common actions that an IBM Cloud Manager with OpenStack administrator might perform to deploy a cloud.

Worksheet: Getting started with a minimal topology

Use this worksheet to review common tasks required to get started with IBM Cloud Manager with OpenStack. This is a common deployment if you want to evaluate and learn more about the product.

Table 15. Getting started

	Tasks	Description
___ 1.	Chapter 2, "Planning for IBM Cloud Manager with OpenStack," on page 7 __ 1. Review "IBM Cloud Manager with OpenStack prerequisites" on page 7 __ 2. Review "Scalability and performance considerations" on page 18	
___ 2.	"Installing IBM Cloud Manager with OpenStack on Linux" on page 21	
___ 3.	"Changing the Chef server password" on page 27	
___ 4.	"Configuring operating system yum repositories on the deployment server" on page 37	
___ 5.	Chapter 5, "Deploying an IBM Cloud Manager with OpenStack cloud," on page 69 __ 1. Review "Topology overview" on page 69 __ 2. Review "Minimal deployment" on page 70 __ 3. Review "Deploying prerequisites" on page 74 __ 4. Create your cloud environment with or without customizations: • With Customizations: "Deploying a prescribed configuration with KVM or QEMU compute nodes" on page 79 • Without Customizations: "Deploying an evaluation cloud" on page 76	
___ 6.	Review "Managing with OpenStack dashboard" on page 253, "Managing with the IBM Cloud Manager with OpenStack self-service portal (Administrator access)" on page 211, and Managing with IBM Cloud Manager with OpenStack self-service portal (User access)	

Worksheet: Controller +*n* compute or distributed database topology

Use this worksheet to review common tasks required to get started with IBM Cloud Manager with OpenStack. This is a common deployment if you want to start using the product in production environments and perform some customization.

Table 16. Getting started

	Tasks	Description
___ 1.	Chapter 2, "Planning for IBM Cloud Manager with OpenStack," on page 7 __ 1. Review "IBM Cloud Manager with OpenStack prerequisites" on page 7 __ 2. Review "Scalability and performance considerations" on page 18	
___ 2.	"Installing IBM Cloud Manager with OpenStack on Linux" on page 21	
___ 3.	"Changing the Chef server password" on page 27	
___ 4.	"Configuring operating system yum repositories on the deployment server" on page 37	
___ 5.	"Installing a network time service" on page 161	
___ 6.	Chapter 5, "Deploying an IBM Cloud Manager with OpenStack cloud," on page 69 __ 1. Review "Topology overview" on page 69 __ 2. Review "Controller +*n* compute deployment" on page 71. __ 3. Review "Distributed database deployment" on page 72. __ 4. Review "Deploying prerequisites" on page 74 __ 5. Complete "Deploying a test or production cloud" on page 77 to create your cloud environment.	
___ 7.	Review "Managing with OpenStack dashboard" on page 253, "Managing with the IBM Cloud Manager with OpenStack self-service portal (Administrator access)" on page 211, and Managing with IBM Cloud Manager with OpenStack self-service portal (User access)	

Chapter 3. Installing and uninstalling IBM Cloud Manager with OpenStack

Use the following topics to install and uninstall IBM Cloud Manager with OpenStack according to your environment configuration.

Important: If you have a previous release that is installed on the deployment server, then IBM Cloud Manager with OpenStack upgrades the deployment server to version 4.2. It is recommended that you back up the deployment server before you upgrade to the current release. For more information, see "Backing up and restoring the deployment server" on page 256.

Installing IBM Cloud Manager with OpenStack on Linux

Installing IBM Cloud Manager with OpenStack on the deployment server is the first step in the process of setting up your cloud.

When you install IBM Cloud Manager with OpenStack the installation process sets up the system as a deployment server. The installation process completes the following tasks:

- Installs and configures the chef-server
- Installs the IBM OpenStack RPM files in a yum repository on the deployment server
- Uploads the OpenStack cookbooks, roles, data bags and sample environments to the chef-server
- Installs an IBM extension to the Chef knife command that enables IBM OpenStack topology deployments

Installing IBM Cloud Manager with OpenStack on Linux by using console installation

You can install IBM Cloud Manager with OpenStack on Linux by using a console.

Before you begin

The hostname for the deployment server must meet the following requirements:

- The host where you install the management server must have a fully qualified domain name that includes the domain suffix. For example, a fully qualified domain name is, *mydeploymentserver.ibm.com*, not *mydeploymentserver*. To verify that the deployment system hostname is a fully qualified domain name, run the following command:

  ```
  $ hostname
  ```

  If the hostname is a fully qualified domain name, it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

- The hostname must be resolvable. Add the hostname for the deployment server to the DNS system. To verify that a hostname is resolvable, run the following command:

  ```
  $ hostname -f
  ```

  If the hostname is resolvable it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

If the hostname is not resolvable, refer to the networking documentation for the platform to get specific guidance on how to add the hostname to the DNS system.

Important: You need root authority to run the installer.

The product installer requires a functional Upstart environment. Upstart is used to manage the service state of the Chef server.

Note: This may not be the case in Docker containers or chroot environments that are common in deployment phases that use Anaconda/Kickstart.
You can verify that Upstart is running with the following command:

```
initctl list
```

About this task

To install IBM Cloud Manager with OpenStack, follow these steps:

Procedure

1. Download the following installation packages:
   - Linux: `cmwo420_xlinux_install.bin` and all `cmwo420_xlinux_install_pkgnn.tar.gz` files
   - Linux on Power: `cmwo420_plinux_install.bin` and all `cmwo420_plinux_install_pkgnn.tar.gz` files

   Copy all of the downloaded files to the same directory on the deployment system: *`INSTALLER_LAUNCH_DIR`*.
2. Optional: You can define a response file for the silent installation. The sample installation response file, `cmwo-install-sample.rsp` that is provided at the download site and on the installation media defines various keyword attributes that can be changed for the installation process. The sample response file includes information in the comments on the use and purpose of each keyword. It includes examples of how to specify the response file when you start the installation.
3. Navigate to the *`INSTALLER_LAUNCH_DIR`* directory from a terminal session and run the following commands:

Platform	Installation commands

Linux	`chmod +x ./cmwo420_xlinux_install.bin`
	`./cmwo420_xlinux_install.bin`

Linux on Power	`chmod +x ./cmwo420_plinux_install.bin`
	`./cmwo420_plinux_install.bin`

4. Follow the installation instructions.
5. The installation log, `IBM_Cloud_Manager_with_OpenStack_Install_MM_DD_YYYY_HH_mm_ss.log`, is located in the following directory: `/opt/ibm/cmwo/_installation/Logs/`

   Note: Low-level detail can be found in the following file: `/tmp/cmwo-installer.log`
6. To verify that the Chef server installed successfully, you can run the following command to check the Chef server status:

   ```
   chef-server-ctl status
   ```

   The command should return output similar to the following example:

```
[root@elvis-chef3 ⌂]# chef-server-ctl status
run: bookshelf: (pid 17198) 201s; run: log: (pid 17197) 201s
run: chef-expander: (pid 17145) 207s; run: log: (pid 17144) 207s
run: chef-server-webui: (pid 17357) 187s; run: log: (pid 17356) 187s
run: chef-solr: (pid 17112) 209s; run: log: (pid 17111) 209s
run: erchef: (pid 17535) 180s; run: log: (pid 17239) 199s
run: nginx: (pid 17518) 181s; run: log: (pid 17517) 181s
run: postgresql: (pid 17015) 220s; run: log: (pid 17014) 220s
run: rabbitmq: (pid 16685) 236s; run: log: (pid 16684) 236s
```

What to do next

When the installation completes, the components that are necessary for creating a cloud environment are installed. Continue with the following steps to create your cloud.

1.

   Important: Download and install the latest fix pack for the IBM Cloud Manager with OpenStack from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.
2. Change the Chef server password.
3. Create an operating system yum repository.
4. Select and deploy a topology for your cloud configuration.

Installing IBM Cloud Manager with OpenStack on Linux by using graphical installation

You can install IBM Cloud Manager with OpenStack on Linux by using a graphical user interface.

Before you begin

The hostname for the deployment server must meet the following requirements:

- The host where you install the management server must have a fully qualified domain name that includes the domain suffix. For example, a fully qualified domain name is, *mydeploymentserver.ibm.com*, not *mydeploymentserver*. To verify that the deployment system hostname is a fully qualified domain name, run the following command:

  ```
  $ hostname
  ```

  If the hostname is a fully qualified domain name, it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

- The hostname must be resolvable. Add the hostname for the deployment server to the DNS system. To verify that a hostname is resolvable, run the following command:

  ```
  $ hostname -f
  ```

  If the hostname is resolvable it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

  If the hostname is not resolvable, refer to the networking documentation for the platform to get specific guidance on how to add the hostname to the DNS system.

Important: You need root authority to run the installer.

The product installer requires a functional Upstart environment. Upstart is used to manage the service state of the Chef server.

Note: This may not be the case in Docker containers or chroot environments that are common in deployment phases that use Anaconda/Kickstart.
You can verify that Upstart is running with the following command:

```
initctl list
```

About this task

To install IBM Cloud Manager with OpenStack, follow these steps:

Procedure

1. Download the following installation packages:
   - Linux: `cmwo420_xlinux_install.bin` and all `cmwo420_xlinux_install_pkgnn.tar.gz` files
   - Linux on Power: `cmwo420_plinux_install.bin` and all `cmwo420_plinux_install_pkgnn.tar.gz` files

   Copy all of the downloaded files to the same directory on the deployment system: *`INSTALLER_LAUNCH_DIR`*.
2. Optional: You can define a response file for the silent installation. The sample installation response file, `cmwo-install-sample.rsp` that is provided at the download site and on the installation media defines various keyword attributes that can be changed for the installation process. The sample response file includes information in the comments on the use and purpose of each keyword. It includes examples of how to specify the response file when you start the installation.
3. Navigate to the *`INSTALLER_LAUNCH_DIR`* directory from a terminal session and run the following commands:

Platform	Installation commands

Linux	`chmod +x ./cmwo420_xlinux_install.bin`
	`./cmwo420_xlinux_install.bin -i gui`

Linux on Power	`chmod +x ./cmwo420_plinux_install.bin`
	`./cmwo420_plinux_install.bin -i gui`

4. Follow the installation instructions.
5. The installation log, `IBM_Cloud_Manager_with_OpenStack_Install_MM_DD_YYYY_HH_mm_ss.log`, is located in the following directory: `/opt/ibm/cmwo/_installation/Logs/`

   Note: Low-level detail can be found in the following file: `/tmp/cmwo-installer.log`
6. To verify that the Chef server installed successfully, you can run the following command to check the Chef server status:

   ```
   chef-server-ctl status
   ```

   The command should return output similar to the following example:

   ```
   [root@elvis-chef3 ⌂]# chef-server-ctl status
   run: bookshelf: (pid 17198) 201s; run: log: (pid 17197) 201s
   run: chef-expander: (pid 17145) 207s; run: log: (pid 17144) 207s
   run: chef-server-webui: (pid 17357) 187s; run: log: (pid 17356) 187s
   run: chef-solr: (pid 17112) 209s; run: log: (pid 17111) 209s
   run: erchef: (pid 17535) 180s; run: log: (pid 17239) 199s
   run: nginx: (pid 17518) 181s; run: log: (pid 17517) 181s
   run: postgresql: (pid 17015) 220s; run: log: (pid 17014) 220s
   run: rabbitmq: (pid 16685) 236s; run: log: (pid 16684) 236s
   ```

What to do next

When the installation completes, the components that are necessary for creating a cloud environment are installed. Continue with the following steps to create your cloud.

1.

   Important: Download and install the latest fix pack for the IBM Cloud Manager with OpenStack from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.
2. Change the Chef server password.
3. Create an operating system yum repository.
4. Select and deploy a topology for your cloud configuration.

Installing IBM Cloud Manager with OpenStack on Linux by using silent installation

You can use a response file to install IBM Cloud Manager with OpenStack on Linux silently.

Before you begin

The hostname for the deployment server must meet the following requirements:

- The host where you install the management server must have a fully qualified domain name that includes the domain suffix. For example, a fully qualified domain name is, *mydeploymentserver.ibm.com*, not *mydeploymentserver*. To verify that the deployment system hostname is a fully qualified domain name, run the following command:

  ```
  $ hostname
  ```

  If the hostname is a fully qualified domain name, it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

- The hostname must be resolvable. Add the hostname for the deployment server to the DNS system. To verify that a hostname is resolvable, run the following command:

  ```
  $ hostname -f
  ```

  If the hostname is resolvable it will return something like:

  ```
  $ mydeploymentserver.ibm.com
  ```

  If the hostname is not resolvable, refer to the networking documentation for the platform to get specific guidance on how to add the hostname to the DNS system.

Important: You need root authority to run the installer.

The product installer requires a functional Upstart environment. Upstart is used to manage the service state of the Chef server.

Note: This may not be the case in Docker containers or chroot environments that are common in deployment phases that use Anaconda/Kickstart.
You can verify that Upstart is running with the following command:

```
initctl list
```

About this task

Procedure

1. Download the following installation packages:
   - Linux: `cmwo420_xlinux_install.bin` and all `cmwo420_xlinux_install_pkgnn.tar.gz` files
   - Linux on Power: `cmwo420_plinux_install.bin` and all `cmwo420_plinux_install_pkgnn.tar.gz` files

   Copy all of the downloaded files to the same directory on the deployment system: *INSTALLER_LAUNCH_DIR*.
2. Define a response file for the silent installation.
   - The only required keyword attribute for the response file is the `LICENSE_ACCEPTED=true` keyword value pair. The silent installation commands show how to populate the response file and launch a silent mode installation in a single command call.
   - The sample installation response file, `cmwo-install-sample.rsp` that is provided at the download site and on the installation media defines various keyword attributes that can be changed for the installation process. The sample response file includes information in the comments on the use and purpose of each keyword. It includes examples of how to specify the response file when you start the installation.
3. Navigate to the *INSTALLER_LAUNCH_DIR* directory from a terminal session and run the following commands:

Platform	Silent installation command

Linux	`chmod +x ./cmwo420_xlinux_install.bin`
	`echo LICENSE_ACCEPTED=true > ./installer.rsp; ./cmwo420_xlinux_install.bin -i silent -f ./installer.rsp`

Linux on Power	`chmod +x ./cmwo420_plinux_install.bin`
	`echo LICENSE_ACCEPTED=true > ./installer.rsp; ./cmwo420_plinux_install.bin -i silent -f ./installer.rsp`

4. The installation process takes several minutes to complete.
5. Check the status of the installation by running the following command:

   ```
   echo $?
   ```

   If the return code is `0`, the installation was successful. If the return code is something other than `0`, refer to the installation logs to determine the problem.
6. The installation log, `IBM_Cloud_Manager_with_OpenStack_Install_MM_DD_YYYY_HH_mm_ss.log`, is located in the following directory: *INSTALLER_LAUNCH_DIR*.

   Note: Low-level detail can be found in the following file: `/tmp/cmwo-installer.log`
7. To verify that the Chef server installed successfully, you can run the following command to check the Chef server status:

   ```
   chef-server-ctl status
   ```

   The command should return output similar to the following example:

```
[root@elvis-chef3 ⌂]# chef-server-ctl status
run: bookshelf: (pid 17198) 201s; run: log: (pid 17197) 201s
run: chef-expander: (pid 17145) 207s; run: log: (pid 17144) 207s
run: chef-server-webui: (pid 17357) 187s; run: log: (pid 17356) 187s
run: chef-solr: (pid 17112) 209s; run: log: (pid 17111) 209s
run: erchef: (pid 17535) 180s; run: log: (pid 17239) 199s
run: nginx: (pid 17518) 181s; run: log: (pid 17517) 181s
run: postgresql: (pid 17015) 220s; run: log: (pid 17014) 220s
run: rabbitmq: (pid 16685) 236s; run: log: (pid 16684) 236s
```

What to do next

When the installation completes, the components that are necessary for creating a cloud environment are installed. Continue with the following steps to create your cloud.

1.

   Important: Download and install the latest fix pack for the IBM Cloud Manager with OpenStack from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.
2. Change the Chef server password.
3. Create an operating system yum repository.
4. Select and deploy a topology for your cloud configuration.

Changing the Chef server password

After you install the IBM Cloud Manager with OpenStack deployment server, you must change the administrator password of the Chef server web user interface.

About this task

Use the following steps to change the password.

Procedure

1. From a web browser, open `https://[deployment-server-fqdn]:14443/`. The login screen displays the current, default administrator password on the right side of the page.
2. Using the default password, log in to the Chef server web user interface.
3. You are prompted to change the password. Enter the new password and confirmation password. You can keep the other values displayed on the page the same.
4. Click **Save User** to apply the changes.

What to do next

To continue, you must create an operating system yum repository. Then, select and deploy a topology for your cloud configuration.

Deploying the z/VM appliance

To use IBM Cloud Manager with OpenStack to manage your cloud environment from a z/VM system, you can deploy the z/VM appliance.

About this task

For more information about enabling z/VM for OpenStack and for information about deploying the z/VM appliance to manage from the z/VM environment, see Enabling z/VM for OpenStack. To deploy the z/VM appliance and manage from the z/VM environment, you must install the required prerequisite

PTFs. For more information about the PTFs, see the Service Information related to IBM Cloud Manager with OpenStack for System z.

Installing and uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent

IBM Cloud Manager with OpenStack can manage Microsoft Hyper-V hypervisors from OpenStack technology. To manage these hypervisors, an IBM Cloud Manager with OpenStack Hyper-V Agent must be installed on the Hyper-V endpoint server.

This IBM Cloud Manager with OpenStack Hyper-V Agent contains packaging of the OpenStack technology that is required to provision to the Hyper-V server. The IBM Cloud Manager with OpenStack Hyper-V Agent can be installed on a Microsoft Hyper-V Server 2012 R2 or Microsoft Windows Server 2012 R2 with the Hyper-V role enabled. The IBM Cloud Manager with OpenStack Hyper-V Agent must be installed on all managed compute nodes. The IBM Cloud Manager with OpenStack Hyper-V Agent installation is packaged as a Microsoft Windows Installer that can be run as an installation wizard, or in silent mode. This installation installs the required OpenStack components on to the Hyper-V server and configures them to run as Microsoft Windows services.

IBM Cloud Manager with OpenStack Hyper-V Agent Installation Prerequisites

Use the following steps to prepare your environment for installation.

Preparing Your Hyper-V Server for Installation

On each Hyper-V server that is managed from IBM Cloud Manager with OpenStack, a Network Time Service (NTP) must be synchronized with the Hyper-V appliance system that is running the IBM Cloud Manager with OpenStack server. Complete the following steps to install the NTP service.

1. Access the NTP installation package, `ntp-4.2.6p5-ibm-win32-setup.exe`, in the root directory of the IBM Cloud Manager with OpenStack installation media.
2. Run the `ntp-4.2.6p5-ibm-win32-setup.exe` file to install the NTP service.
3. After the NTP package is installed, specify the NTP server IP address or host name in `C:\ntp\etc\ntp.conf`.

```
# your local system clock, could be used as a backup
# (this is only useful if you need to distribute time no
matter how good or bad it is)

server x.x.x.x

# but it should operate at a high stratum level to let the
```

4. Navigate to **Control Panel** > **System and Security** > **Administative Tools** > **Services**, and start **Network Time Protocol Daemon** service.

See the following document in the OpenStack Compute Administration Guide for more details: Hyper-V Virtualization Platform.

Note: Before you can install the IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Windows Server 2012 R2, ensure that the Hyper-V role is enabled on the server.

Preparing the Host

The host must be a domain joined computer to support live migration. If the host is not a domain joined computer, you might see the following error display during installation:

```
Failed to modify service settings. Live migrations can be enabled only on a domain joined
computer.
```

Preparing the User

Add the user who installs the Hyper-V Agent for IBM Cloud Manager with OpenStack to the Hyper-V Administrators group.

Note: If you are creating the user profile for the first time, the Hyper-V server must be restarted before you install the IBM Cloud Manager with OpenStack Hyper-V Agent.

If the user plans to uninstall the Hyper-V Agent in the future, ensure that the user has permission to each of the installation directories on the system.

Installing the IBM Cloud Manager with OpenStack Hyper-V Agent

Follow these steps to install the IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Windows Server 2012 R2 or Microsoft Hyper-V Server 2012 R2.

Overview of the installation

The installation completes the following steps:

- Create a product installation directory
- Create a Hyper-V external virtual switch (optional)
- Configure Hyper-V Live Migration settings for this host (optional)
- Install an independent Python environment to avoid conflicts with existing applications

  Note: This embedded Python environment is only intended for use by the IBM Cloud Manager with OpenStack Hyper-V Agent. Do not attempt to access this environment from any other application. This independent environment is designed to coexist with any preexisting Python environments that might already be installed on the system. Do not install new Python modules into the embedded Python environment.
- Install the required Python modules/packages required by the application
- Install and configure the OpenStack Nova Compute service
- Install and configure the OpenStack Hyper-V Neutron agent for networking
- Register two Windows services, which are set to auto-start by default:
  - **IBM Cloud Manager with OpenStack Network Service**
  - **IBM Cloud Manager with OpenStack Compute Service**

Important:

- The 4.2 Hyper-V agent installer supports two message queue types, RabbitMQ and Qpid. You must select a message queue type that is consistent with the controller node.
- IBM Cloud Manager with OpenStack by default enables Platform Resource Scheduler in the controller node. To complete the installation, update `nova.conf` file by appending *ibm_notifications* to **`notification_topics`** like "**`notification_topics`**=notifications,*ibm_notifications*", and then restart the IBM Cloud Manager with OpenStack compute service.
- If you migrate IBM SmartCloud® Entry 3.2 to IBM Cloud Manager with OpenStack 4.1, the neutron password is *neutron* by default. If you install a new Hyper-V Agent, you must change the default password for neutron to *neutron* to be consistent with the controller node.
- The 3.1 Hyper-V agent installer does not prevent users from installing a previous version over the more recent Hyper-V agent.

Creating installation or uninstallation logs

Follow these steps to create installation or uninstallation logs for use during the installation or uninstallation of IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Windows Server 2012 R2.

About this task

Because the IBM Cloud Manager with OpenStack Hyper-V Agent installer is MSI-based, you can create an installation or uninstallation log by starting the installer with the `msiexec` command with the correct parameters. Detailed information about creating logs can be found here: How to enable Windows Installer logging.

Graphical Installation

Follow these steps to install the IBM Cloud Manager with OpenStack Hyper-V Agent by using the graphical installation wizard.

Procedure

1. Download the latest fix for the IBM Cloud Manager with OpenStack Hyper-V Agent from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent and the OpenStack controller node must be at the same level, either the GA level, or the fix level.
2. Locate the installation image, and double-click `IBM Cloud Manager with OpenStack Hyper-V Agent.msi` to start the installation wizard.
3. Follow the instructions that are provided by the installation wizard. Agree to the license terms, provide an installation destination directory, and select the type of setup you want to use.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent must be installed to the local C: disk of the server. However, the instance directory (Instances Path) that is used to store virtual machine instance data can be on any local disk.
4. Use the **Nova Compute Configuration** window to configure the compute agent parameters. You can leave the default values provided and manually configure the `nova.conf` file, which is in the `etc\nova` folder, later. The following table shows the mappings between areas from this dialog and properties in the `nova.conf` file.

Table 17. Nova Compute Configuration fields and related properties in `nova.conf`. Mapping of field names in the installation wizard, related properties in the `nova.conf` file, and installation wizard default values

Area in dialog	Property in `nova.conf`	Installation wizard default values
Glance API Server	*glance_host*	*`appliance_mgmt_ip`* **Note:** Where *`appliance_mgmt_ip`* is the IP address of the network interface on the appliance.
Port (after Glance API Server)	*glance_port*	9292
Message Queue Type	**Note:** There is no related property in `nova.conf`.	*`RabbitMQ`* **Note:** 1. Supports RabbitMQ or Qpid. 2. Be consistent with the message queue type on the controller node.
Message Queue Server	*qpid_hostname* or *rabbit_host*	*`appliance_mgmt_ip`* **Note:** Where *`appliance_mgmt_ip`* is the IP address of the network interface on the appliance.

Table 17. Nova Compute Configuration fields and related properties in `nova.conf` (continued). Mapping of field names in the installation wizard, related properties in the `nova.conf` file, and installation wizard default values

Area in dialog	Property in `nova.conf`	Installation wizard default values
Port (after Message Queue Server)	*qpid_port* or *rabbit_port*	5671
Message Queue User Name	*qpid_username* or *rabbit_userid*	rabbitclient
Password	*qpid_password* or *rabbit_password*	openstack1
Instances Path	*instances_path*	`C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\`

Note: The property **`qpid_hostname`** or **`rabbit_userid`** is also written to the file `hyperv_neutron_agent.ini`. For more detailed descriptions about properties in the `nova.conf` file, see the List of configuration options topic in the OpenStack Compute Administration Manual.

5. Use the **Nova Compute Advanced Configuration** window to configure the advanced compute agent parameters. Select **Use Cow Images** to enable the copy on write feature and speed up deployment times. You can also manually configure the `nova.conf` file, which is in the `etc\nova` folder, later. The following table shows the mappings between areas from this dialog and properties in the `nova.conf` file.

Table 18. Nova Compute Advanced Configuration fields and related properties in `nova.conf`. Mapping of field names in installation wizard and related properties in the `nova.conf` file

Area in dialog	Property in `nova.conf`
Use Cow Images	*use_cow_images*
Verbose Logging	*verbose*
Log file	*logdir*

6. Use the **Neutron Network Configuration** window to configure network agent parameters. The installation wizard applies changes that are made to this window to properties in both the `nova.conf` and `neutron.conf` files. You can leave the default values provided and manually configure the `nova.conf` and `neutron.conf` files later. These properties files are in the `etc\nova` and `etc\neutron` folders. The following table shows the mappings between areas from this dialog and properties in the `nova.conf` and `neutron.conf` files.

Table 19. Neutron Network Configuration fields and related properties in `nova.conf` and `neutron.conf`. Mapping of field names in the installation wizard, related properties in the `nova.conf` file and `neutron.conf` file, and installation wizard default values

Area in dialog	Property in `nova.conf` and `neutron.conf`	Installation wizard default values
Neutron URL	*neutron_url*	http://*appliance_mgmt_ip*:9696 **Note:** Where *`appliance_mgmt_ip`* is the IP address of the network interface on the appliance.
Username	*neutron_admin_username*	neutron
Password	*neutron_admin_password*	openstack-network
Tenant Name	*neutron_admin_tenant_name*	service
Region name	*neutron_region_name*	RegionOne
Authentication Url	*neutron_admin_auth_url*	http://*appliance_mgmt_ip*:35357/v2.0 **Note:** Where *`appliance_mgmt_ip`* is the IP address of the network interface on the appliance.

Note: The file, hyperv_neutron_agent.ini, is also updated in the background by the installer. The following properties are updated:

- rpc_backend=neutron.openstack.common.rpc.impl_qpid or neutron.openstack.common.rpc.impl_kombu, based on the message queue type that you select.
- verbose=true
- debug=true
- control_exchange=neutron
- physical_network_vswitch_mappings = *:external

7. Use the **Hyper-V Live Migration Settings** window to configure the Live Migration settings for the host.

   Note: IBM Cloud Manager with OpenStack with Hyper-V supports a Shared nothing live migration. To use live migration, the Hyper-V server must belong a common domain. You can also skip this step and configure the Hyper-V Live Migration setting manually later. See the following document in the OpenStack Compute Administration Guide for more details: Hyper-V Virtualization Platform

   Note: When you provide a user name in the **Nova compute service user** field, ensure that the user you select is a domain user.
8. Use the **Virtual Switch Configuration** window to configure Virtual Switch settings. For more information about Hyper-V Switches, see the following topic:Hyper-V Virtual Switch Overview. If no existing virtual switches are detected, create a new virtual switch. To add a new virtual switch, there must be at least one physical network adapter that is not bound to any existing virtual switch. To manually determine whether a physical network adapter is available, you can use the PowerShell command `get-networkadapter -physical'` to see all physical network adapters. Next, you can use the PowerShell command `get-vmswitch` to see all network adapters that are already in use. A new virtual switch must be exclusively associated with a physical network adapter. No two virtual switches can be associated with the same physical network adapter on the host. See the following document in the OpenStack Compute Administration Guide for more details on using the PowerShell command: Hyper-V Virtualization Platform

   Note: The **Shared for management** property determines whether the Hyper-V Agent can use this physical network adapter to manage network traffic.
9. After you complete the information in the installation wizard, the installation begins.

Silent installation

Because the IBM Cloud Manager with OpenStack Hyper-V Agent is installed by using the Microsoft Installer (MSI), you can start MSI directly without using the graphical installation wizard. This process is called silent (unattended) installation, and is useful for installing this program over a network on a remote system from a shared drive on a LAN server. Follow these steps to silently install IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Windows Server 2012 R2.

Before you begin

If you choose to install silently, you must create an IBM Cloud Manager with OpenStack Hyper-V Agent silent installation response file and use it to drive the installation. The file is addressed in the following sections, and a sample response file is provided for reference

About this task

To install silently, you either provide installation parameters through the command line, or use an INI file (response file) to specify all the parameters in a single file. For both cases, use the `msiexec` command to start the installation. For more information about this command, see Msiexec (command-line options)

Installing silently with the command line:

Follow these steps to silently install IBM Cloud Manager with OpenStack Hyper-V Agent by using the command line.

Before you begin

If you choose to install silently, you must create an IBM Cloud Manager with OpenStack Hyper-V Agent silent installation response file and use it to drive the installation. The file is addressed in the following sections, and a sample response file is provided for reference.

Procedure

1. Download the latest fix for the IBM Cloud Manager with OpenStack Hyper-V Agent from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent and the OpenStack controller node must be at the same level, either the GA level, or the fix level.
2. To start the installation through the command line directly, open a command prompt and input the following parameters, substituting the IP address and port with your own: `msiexec /i "Hyper-V-OpenStack installer.msi" /qn GLANCE_SERVER="127.0.0.1"  GLANCE_SVR_PORT = "9292"`

   Tip: The `/i` parameter means to install, and the `/qn` parameter means that the installation is done with no GUI.

   Tip: You can provide as many parameters as you like in the format `key=value`, separated by a space character at the end of the command.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent must be installed to the local C: disk of the server. However, the instance directory (Instances Path) that is used to store virtual machine instance data can be on any local disk.

Example

The following table shows the mappings between parameters in the response file and properties in the `nova.conf` file.

Table 20. Response file parameters and related properties in `nova.conf`. This table shows the mappings between parameters in the response file and properties in the `nova.conf` file.

Parameters in the response file	Property in `nova.conf`
GLANCE_SERVER	glance_host
GLANCE_SVR_PORT	glance_port
MESSAGE_QUEUE_TYPE[1]	**Note:** There is no related property in `nova.conf`.
QPID_SERVER	qpid_hostname or rabbit_host
QPID_SVR_PORT	qpid_port or rabbit_port
QPID_UNAME	qpid_username or rabbit_userid
QPID_PWD	qpid_password or rabbit_password
INSTANCES1	instances_path
COW	use_cow_images
VERBOSE	verbose
NOVA_LOG_PATH	Logdir

Table 20. Response file parameters and related properties in `nova.conf` (continued). This table shows the mappings between parameters in the response file and properties in the `nova.conf` file.

Parameters in the response file	Property in **nova.conf**
[1]MESSAGE_QUEUE_TYPE parameter in the response file is the message queue type, which has no related property in `nova.conf`. MESSAGE_QUEUE_TYPE = "1" means you select RabbitMQ as the message queue, which is the default value. MESSAGE_QUEUE_TYPE = "0" means you select Qpid as the message queue.	

The following table shows the mappings between parameters in the response file and properties in both the `nova.conf` and `neutron.conf` files

Table 21. Response file parameters and related properties in `nova.conf` and `neutron.conf` files. This table shows the mappings between parameters in the response file and properties in the `nova.conf` and `neutron.conf` files.

Parameters in the response file	Property in **nova.conf** and **neutron.conf**
NEUTRON_URL	neutron_url
ADMIN_USERNAME	neutron_admin_username
ADMIN_PASSWORD	neutron_admin_password
ADMIN_TENANT_NAME	neutron_admin_tenant_name
REGION_NAME	neutron_region_name
NEUTRON_AUTH_URL	neutron_admin_auth_url
ALLOW_RESIZE_TO_SAME_HOST	allow_resize_to_same_host
NEUTRON_AUTH_STRATEGY	neutron_auth_strategy

Note: The property `;AgreeToLicense` in the response file specifies your agreement to the license for the application. Its default value is set to `no`. You must specify `yes` to run the silent installation successfully.

Installing silently with a response file:

Follow these steps to run a silent installation by using a response file.

Before you begin

If you choose to install silently, you need to create an IBM Cloud Manager with OpenStack Hyper-V Agent silent installation response file and use it to drive the installation. The file is addressed in the following sections, and a sample response file is provided for reference.

Procedure

1. Download the latest fix for the IBM Cloud Manager with OpenStack Hyper-V Agent from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent and the OpenStack controller node must be at the same level, either the GA level, or the fix level.
2. To run the installation through the response file, you must first enter the correct parameters in your locally saved copy of the response file. See the sample response file that is provided for more details.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent must be installed to the local C: disk of the server. However, the instance directory (Instances Path) that is used to store virtual machine instance data can be on any local disk.
3. Next, open a command prompt and input the following statement:

   ```
   msiexec /i "Hyper-V-OpenStack installer.msi" /qn USEINI="absolute path to responsefile"
   ```

Example

The sample response file provides an example INI file that can be used to drive a silent installation. This example shows all properties that are available during a graphical installation of the IBM Cloud Manager with OpenStack Hyper-V Agent.

```
[Response]
#indicate whether you agree with the liscense and its default value is "no"
AgreeToLicense=yes
GLANCE_SERVER=controllerNodeHostOrIP
GLANCE_SVR_PORT=9292
#(IntOpt)The message queue type you select. It has two optional values, "0" and "1".
#Set "1" means you select RabbitMQ as the message queue.
#Set "0" means you select QPID as the message queue.
MESSAGE_QUEUE_TYPE=1
QPID_SERVER=controllerNodeHostOrIP
QPID_SVR_PORT=5671
QPID_UNAME=rabbitclient
QPID_PWD=openstack1
NEUTRON_URL=http://127.0.0.1:9696
ADMIN_USERNAME=neutron
ADMIN_PASSWORD=openstack1
ADMIN_TENANT_NAME=service
REGION_NAME=RegionOne
NEUTRON_AUTH_URL=http://127.0.0.1:35357/v2.0
NEUTRON_URL_TIMEOUT=30
ALLOW_RESIZE_TO_SAME_HOST=True
NEUTRON_AUTH_STRATEGY=keystone
INSTANCES1=C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\instances
COW=true
ENABLELOG=1
VERBOSE=true
NOVA_LOG_PATH=C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\log\nova\

#The path that IBM SCE Hyper-V Agent will be installed.
INSTALLDIR=C:\Program Files (x86)\IBM\Cloud Manager with OpenStack\Hyper-V Agent\
#The string coming after a period is the UUID of the DIM used by the installer internally.
#You can actually ignore it during the installation.
#(IntOpt)Live Migration authentication type you choose. It has two optional values, "0" and "1".
#"0" stands for "Kerberos", and "1" stands for "CredSSP".
LIVEMIGRAUTHTYPE.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=0
NOVACOMPUTESERVICEUSER.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=
#(IntOpt)The max active virtual machine migrations.
MAXACTIVEVSMIGR.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=
(IntOpt)The max active storage migrations.
MAXACTIVESTORAGEMIGR.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=
#(IntOpt)The networks you migrate from. It has two optional values, "0" and "1".
#Set "1" means you can migrate from any network, and the following property MIGRNETWORKS will be disabled.
#Set "0" means you have to specify the network you migrate from by stating the following property.
MIGRNETWORKSANY_INTERNAL.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=1
#(IntOpt)Specific network you migrate from.
#This property only make sense when the MIGRNETWORKSANY_INTERNAL is set to "0".
MIGRNETWORKS.EDDDE39A_8D99_430B_BFF6_7644F125D2A1=10.10.10.1/32

#(IntOpt) It has two optional values, "0" and "1".
#Set to "1" means you will skip the virtual switch configuration, and the following four properties
#SKIPNOVACONF, ADDVSWITCH, VSWITCHNAME, VSWITCHNETADAPTER,NEWVSWITCHNAME, VSWITCHSHARED will be disabled.
#Set "0" means you configure the virtual switch during installation.
SKIPNOVACONF.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=1
#(IntOpt)Whether to add a virtual switch. It has two optional values, "0" and "1".
#Set "1" means a newvirtual switch will be add, and the following property VSWITCHNAME will be disabled.
#Set "0" means you will use an existing virtual switch,
#and the following property VSWITCHNETADAPTER and NEWVSWITCHNAME will be disabled.
ADDVSWITCH.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=0
#(StrOpt)The name of an existing virtual switch you choose.
VSWITCHNAME.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=
#(StrOpt)The adapter you use to create a new virtual switch.
```

```
VSWITCHNETADAPTER.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=
#(StrOpt)The name you use to create a new virtual switch.
NEWVSWITCHNAME.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=
#(IntOpt) It has two optional values, "0" and "1".
#Set to "1" to allow management operating system toshare this network adapter. Set to "0" to disable it
VSWITCHSHARED.D5E17CCE_FABA_4230_9715_2DF2AA168F6C=

# End of the file
```

Notes:

1. The property `AgreeToLicense` in the response file specifies your agreement to the license for the application. Its default value is set to `no`. You must specify `yes` to run the silent installation successfully.
2. A response file must start with `[Response]`, followed by any parameters in format `key=value`.
3. Check the node `['openstack']['mq']['service_type']` attribute in the controller node environment to determine whether the QPID or RabbitMQ is used.

Uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent

The IBM Cloud Manager with OpenStack Hyper-V Agent uninstaller supports uninstallation by using the Microsoft Windows Control Panel and command line.

About this task

Use the following steps to uninstall the IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Windows:

Procedure

1. Shut down the IBM Cloud Manager with OpenStack Hyper-V Agent by using the Microsoft Windows Services panel or the appropriate command line.
2. Navigate to Start > Control Panel > Programs > Uninstall a program
3. Select **IBM OpenStack Hyper-V Agent** and click **Uninstall**.
4. Follow the instructions on the uninstallation wizard to complete the operation.

Results

After the IBM Cloud Manager with OpenStack Hyper-V Agent is uninstalled, the uninstaller will back up the following files to the `%USERPROFILE%/AppData` folder:

- `nova.conf`
- `neutron.conf`
- `hyperv_neutron_agent.ini`

Note: The uninstaller does not delete any existing instances that you started. These instances are saved in the instances folder.

Uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Hyper-V Server 2012 R2

The IBM Cloud Manager with OpenStack Hyper-V Agent uninstaller supports uninstallation from the Microsoft Hyper-V Server 2012 R2 command line.

About this task

Use the following steps to uninstall The IBM Cloud Manager with OpenStack Hyper-V Agent on Microsoft Hyper-V Server 2012 R2:

Procedure

1. Shut down the IBM Cloud Manager with OpenStack Hyper-V Agent by using the Microsoft Windows Services panel or the appropriate command line.
2. Open a command-line window and enter the following command: `WMIC`.
3. Enter the following command to display a list of installed products: `product get name`.
4. Enter the command `product name call uninstall`, where `product name` is the name of the IBM Cloud Manager with OpenStack Hyper-V Agent installed product.
5. Enter `Y` to uninstall.

Results

After the IBM Cloud Manager with OpenStack Hyper-V Agent is uninstalled, the uninstaller will back up the following files to the `%USERPROFILE%/AppData` folder:

- `nova.conf`
- `neutron.conf`
- `hyperv_neutron_agent.ini`

Note: The uninstaller does not delete any existing instances that you started. These instances are saved in the instances folder.

Configuring operating system yum repositories on the deployment server

After you install IBM Cloud Manager with OpenStack on the deployment server, you must determine how your Linux nodes can access yum repositories that contain operating system packages that are required when OpenStack is deployed.

About this task

You have the following options for configuring yum repositories:

- You can use your own yum repositories. If you choose this option, the yum repositories must be configured on the nodes before deploying OpenStack. If you choose to use your own yum repositories, the following steps are unnecessary. To determine if a node has access to a yum repository, you can run the **`yum list libvirt`** command on the node. If the command fails, a valid yum repository does not exist on the node.
- You can use the following instructions to allow the deployment server to serve as a yum repository. When the deployment server is configured as a yum repository, the yum repositories are configured on the nodes automatically when OpenStack is deployed.

Note: RDO repositories are not supported because they contain packages that conflict with IBM Cloud Manager with OpenStack.

The operating system installation media for the node system contains all of the packages that are required to deploy OpenStack. You can access the operating system installation media by inserting the installation media for the node into the DVD device or by mounting the installation ISO image for the node system.

The deployment server is configured to serve these packages from the following locations:

Packages:

`<`*`installation directory`*`>/yum-repo/operatingsystem/<`*`platform`*`><`*`platform version`*`>/<`*`architecture`*`>`

Package updates:

```
<installation directory>/yum-repo/operatingsystem/<platform><platform version>/<architecture>/updates
```

Where the variables have the following definitions:

installation directory
: The location where IBM Cloud Manager with OpenStack is installed, typically `/opt/ibm/cmwo`.

platform
: The platform of the node system. For example, `redhat` or `ibm_powerkvm`.

platform version
: The version of the operating system on the node system. For example, `6.5` or `2.1`.

architecture
: The architecture for the node system. For example, `x86_64` or `ppc64`.

An x86 64-bit Red Hat Enterprise Linux 6.5 node system requires the packages to be in the following directories:

```
/opt/ibm/cmwo/yum-repo/operatingsystem/redhat6.5/x86_64
/opt/ibm/cmwo/yum-repo/operatingsystem/redhat6.5/x86_64/updates
```

An IBM PowerKVM 2.1 node system requires the packages and updates to be in the following directories:

```
/opt/ibm/cmwo/yum-repo/operatingsystem/ibm_powerkvm2.1/ppc64
/opt/ibm/cmwo/yum-repo/operatingsystem/ibm_powerkvm2.1/ppc64/updates
```

To configure the deployment server, complete the following steps:

Note: The following steps use the Red Hat Enterprise Linux 6.5 version and x86 64-bit architecture. However, similar steps apply for other supported options.

Procedure

1. Create the directories for packages and package updates on the deployment server as appropriate for your environment.
2. Copy the Packages and repodata directory from the installation media to the packages directory on the deployment server.

   ```
   $ cd /opt/ibm/cmwo/yum-repo/operatingsystem/redhat6.5/x86_64
   $ cp -r /mnt/iso/Packages .
   $ cp -r /mnt/iso/repodata .
   ```

   Note: Alternatively, you can create a symbolic link to the installation media. If you create the symbolic link, you do not create the *architecture* directory. Instead, make a symbolic link to the installation media.

   ```
   $ cd /opt/ibm/cmwo/yum-repo/operatingsystem/redhat6.5/x86_64
   $ ln -s /mnt/iso/Packages
   $ ln -s /mnt/iso/repodata
   ```

   If you use the symbolic link, you need to ensure that the mount point persists the deployment server is restarted.
3. Optional: If you have package updates, you can create an updates repository as follows.
   a. On the deployment server, install the `createrepo` package. This package is used to create a yum repository and is available as part of the base operating system packages.

      ```
      $ yum install createrepo
      ```

      Note: Details about yum repositories and creating repositories is beyond the scope of this document. If you need more information, see your operating system documentation.

b. Acquire the updated package for your environment and place it in the updates directory.
   `/opt/ibm/cmwo/yum-repo/operatingsystem/redhat6.5/x86_64/updates`

c. Run the **createrepo** command to create the updates repository:

```
$ cd updates
$ createrepo .
```

Results

When the deployment server is set up as a yum repository for the operating system packages and updates, these yum repositories are automatically configured on the node systems during the deployment process. You do not need to manually add these yum repositories on the node systems.

Related reference:

"Operating system repository not found" on page 307
You might see an error in the log file that the yum repository is not available.

Applying fixes and updates

You can apply fixes and updates for the IBM Cloud Manager with OpenStack product.

Related tasks:

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

"Getting fixes from Fix Central" on page 297
You can use Fix Central to find the fixes that are recommended by IBM Support for a variety of products, including IBM Cloud Manager with OpenStack. With Fix Central, you can search, select, order, and download fixes for your system with a choice of delivery options. A IBM Cloud Manager with OpenStack product fix might be available to resolve your problem.

Applying fixes and updates for IBM Cloud Manager with OpenStack

Updates for IBM Cloud Manager with OpenStack provide fixes to the product.

About this task

There are two steps to apply updates.

1. Update IBM Cloud Manager with OpenStack on the deployment server.
2. Update the topology on the client nodes.

Use the following steps to install a IBM Cloud Manager with OpenStack fix pack. The fix pack updates Chef cookbooks and other resources that are stored on the deployment server. It does not apply updates to the client nodes in your topology.

After you install the fix pack, you can deploy the fix pack to your topology.

To install a IBM Cloud Manager with OpenStack fix pack, complete the following steps:

Procedure

1. Copy the IBM Cloud Manager with OpenStack fix pack files to a temporary directory, for example `/tmp/cmwo_fixpack`, on the deployment server.
2. Extract the fix pack files.

```
# cd /tmp/cmwo_fixpack
# tar -zxf cmwo_fixpack_4.2.0.1.tar.gz
```

3. Run the fix pack installation script.

```
# ./install_cmwo_fixpack.sh
```

4. The script output indicates whether the installation succeeded or failed and stores a copy of the fix pack log files in the `<product_dir>/version` directory, where `<product_dir>` is the directory where IBM Cloud Manager with OpenStack was installed. The default path is `/opt/ibm/cmwo`.

What to do next

The `<product_dir>/version` directory keeps an overall history of fix pack installs and records the fix pack level in the `product.version` file.

After you install the IBM Cloud Manager with OpenStack fix pack on the deployment server, you can deploy the fixes to your topology using the `knife os manage update` tool. The tool uses the chef server and client to update the client nodes, and can be used to update single nodes or all nodes in your topology. Update the OpenStack controller and database nodes first, then update the compute nodes.

For more information about updating the topology on the client nodes, see “Updating a deployed topology” on page 149.

Related tasks:

“Getting fixes from Fix Central” on page 297
You can use Fix Central to find the fixes that are recommended by IBM Support for a variety of products, including IBM Cloud Manager with OpenStack. With Fix Central, you can search, select, order, and download fixes for your system with a choice of delivery options. A IBM Cloud Manager with OpenStack product fix might be available to resolve your problem.

Applying fixes and updates for DB2

Updates for DB2 provide fixes to the DB2 database server.

About this task

These instructions assume you installed DB2 10.5, fix pack 2 and would like to install 10.5, fix pack 3.

To install a DB2 fix pack, complete the following steps:

Procedure

1. Extract the DB2 fix pack.

   ```
   $ tar –zxvf v10.5fp3_linuxx64_server.tar.gz
   ```

2. Shut down DB2.
   a. View the number of instances, using the following command:**`$ db2ilist`**.
   b. Run the following commands on each DB2 instance.

   ```
   $ su – db2inst1

   $ db2 force applications all
   DB20000I  The FORCE APPLICATION command completed successfully.
   DB21024I  This command is asynchronous and may not be effective immediately.

   $ db2 terminate
   DB20000I  The TERMINATE command completed successfully.

   $ db2stop
   SQL1064N  DB2STOP processing was successful.
   ```

3. Stop the DB2 administrator server (DAS).

   Note: This step is not applicable if you do not have a DAS user.

```
$ su – dasusr1

$ db2admin stop
SQL4407W  The DB2 Administration Server was stopped successfully.
```

4. Remove the DB2 IPC resources for the engine and clients on each instance.
   ```
   $ su – db2inst1

   $ ipclean
   Application ipclean: Removing DB2 engine and client IPC resources for db2inst1.
   ```
5. Upgrade to DB2 10.5, fix pack 3.
   ```
   $ ./installFixPack -b /opt/ibm/db2/V10.5/
   Do you want to choose a different installation directory for the fix pack? [yes/no]
   ------------------------------------------------------------------------------------
   no
   ```
6. Verify the new version of DB2.
   ```
   $ db2level

   DB21085I  This instance or install (instance name, where applicable:
   "db2inst1") uses "64" bits and DB2 code release "SQL10053" with level
   identifier "0604010E".
   Informational tokens are "DB2 v10.5.0.3", "s140203", "IP23551", and Fix Pack
   "3".
   Product is installed at "/opt/ibm/db2/V10.5".
   ```

Related tasks:

"Getting fixes from Fix Central" on page 297
You can use Fix Central to find the fixes that are recommended by IBM Support for a variety of products, including IBM Cloud Manager with OpenStack. With Fix Central, you can search, select, order, and download fixes for your system with a choice of delivery options. A IBM Cloud Manager with OpenStack product fix might be available to resolve your problem.

Best practices for maintaining a multi-region cloud or test cloud

You can use a single IBM Cloud Manager with OpenStack deployment server to deploy multiple clouds or a multi-region cloud. Alternatively, you can choose to manage each cloud or region from its own IBM Cloud Manager with OpenStack deployment server.

Whether you decide to maintain a single deployment server or multiple deployment servers determines how you manage updates or upgrades.

Requirements and constraints

- A given IBM Cloud Manager with OpenStack deployment server propagates a single release and fix level to its managed nodes. Any changes that you make to a managed server through IBM Cloud Manager with OpenStack will update that managed server to the current fix level of the deployment server.
- All servers within a single region must be managed by a single IBM Cloud Manager with OpenStack installation.
- Regions within a cloud are required to be at the same release, but not necessarily the same fix level. However, fixes that you make to a shared resource, such as Keystone, self-service portal, or dashboard, require an update to the region that owns that resource.

Considerations

- Consider having a test cloud that is managed from its own IBM Cloud Manager with OpenStack deployment server. Install fix packs or new releases of IBM Cloud Manager with OpenStack on the deployment server that is managing the test cloud. After you have tested the fixes on the test cloud, you can then install the fix pack or new release on the deployment server or servers that are managing the production cloud.

- Keep the region that owns shared resources, such as Keystone, self-service portal, and dashboard, at the latest fix level within your cloud.

Uninstalling IBM Cloud Manager with OpenStack

You can uninstall IBM Cloud Manager with OpenStack from the deployment server. You can also uninstall the optionally installed IBM Cloud Manager with OpenStack self-service portal.

Uninstalling IBM Cloud Manager with OpenStack from deployment server

The IBM Cloud Manager with OpenStack uninstaller for the deployment server, similar to the installer, supports three installation types: console, silent, and graphical installers.

About this task

The default display type is `console`.

Complete the following steps to uninstall IBM Cloud Manager with OpenStack from the deployment server:

Procedure

1. Run the uninstaller with root authority by running the following command:
   ```
   cmwo_uninstall
   ```
2. To uninstall IBM Cloud Manager with OpenStack using a non-default installation type, start the uninstaller from the command line and enter `-i <uninstall type>` where `<uninstall type>` is `silent`, or `gui`.

Results

IBM Cloud Manager with OpenStack is uninstalled from the deployment server. After the uninstall is complete, you must restart the system.

The uninstallation log, `IBM_Cloud_Manager_with_OpenStack_Uninstall_MM_DD_YYYY_HH_mm_ss.log`, is in the user's home directory.

Note: The `/tmp/cmwo-uninstaller.log` file contains low-level detail.

Restriction: Support does not exist to uninstall a deployed topology for IBM Cloud Manager with OpenStack. The node system where a topology is deployed must be re-installed or reset back to its pre-deployment state to remove the deployed topology.

Uninstalling the self-service portal on Linux

You can disable and uninstall the IBM Cloud Manager with OpenStack self-service portal from your deployed topology.

About this task

1. Update the following attribute in the `override_attributes` section of your environment file. In a multi-region cloud environment, this must be done for each region's environment.
   ```
   ibm-sce.service.enabled: false
   ```
2. Replace the **`ibm-sce-node`** role with the **`ibm-sce::uninstallsce`** recipe in your topology file, `your-topology-name.json`.

Replace *role[ibm-sce-node]* with *recipe[ibm-sce::uninstallsce]* in the **`run_list`** for the node running the self-service portal. For example, in a `Minimal` topology file, you would replace the **`ibm-sce-node role`**, as shown.

```
"runlist":[
  "role[ibm-os-allinone-kvm]",
  "recipe[ibm-sce::uninstallsce]"
]
```

3. Follow the instructions in the “Updating a deployed topology” on page 149 topic to complete disabling and uninstalling the self-service portal.

Note: For topology deployments with OpenStack, the preceding steps disable and uninstall the self-service portal only. They do not roll back the OpenStack policy files (that the self-service portal replaced) nor do they remove the `sceagent` user that is registered in OpenStack.

To roll back the OpenStack policy files, complete the following steps:

1. Log in to the controller node and go to the `"/etc/keystone/"` folder.
2. Run the following commands:

   ```
   $ mv policy.json.openstack policy.json
   $ chmod 644 policy.json
   $ chown root:keystone policy.json
   ```

3. Go to each of the folders below, one by one, and run the command in step 2 again from each folder, replacing *keystone* with the appropriate component.
   - `/etc/glance/`
   - `/etc/nova/`
   - `/etc/neutron/`
   - `/etc/cinder/`
4. Run the following commands on the controller node to restart the OpenStack block storage and image API services:

   ```
   $ service openstack-cinder-api restart
   $ service openstack-glance-api restart
   ```

Chapter 4. Upgrading IBM Cloud Manager with OpenStack

This section describes the in-place upgrade process to move to the latest release.

Upgrading the topology

You can complete an in-place upgrade from IBM Cloud Manager with OpenStack, version 4.1 to IBM Cloud Manager with OpenStack, version 4.2.

About this task

Upgrade support is provided for all the IBM Cloud Manager with OpenStack topologies: `Minimal`, `controller + n compute`, `distributed database`, and distributed using Cinder driver configuration.

Before you begin, ensure that the following assumptions are true:

- The cloud environment (including PRS, PowerVC driver, z/VM driver, self-service portal, and so on) is deployed by the IBM Cloud Manager with OpenStack 4.1 deployment server, using Chef cookbooks, with the **`knife os manage deploy topology xxx`** command.
- The Chef server that is installed by the IBM Cloud Manager with OpenStack deployer in the deployment server must only be used to install IBM OpenStack, but cannot be used to run other cookbooks for any other purposes. You must not change the environment or runlist assigned to any nodes.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must add the `--use-qpid` option when you run the upgrade command. It is unsupported to switch the message queue from `qpid` to `rabbitmq` in this configuration.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must check the file permission for `/var/log/cinder/cinder.log` on the controller node and cinder node. The file permission must be `cinder:cinder`. If the file permission is `root:root`, you need to run **`chown cinder:cinder /var/log/cinder/cinder.log`** to change the file permission.
- If you used IBM Platform Resource Scheduler in IBM Cloud Manager with OpenStack 4.1, disable **`nova-ibm-ego-ha-service`** on the controller node by running the following command:

  ```
  nova service-disable $controller-node nova-ibm-ego-ha-service
  ```

  where *$controller-node* is the hostname where the **`nova-ibm-ego-ha-service`** runs. You can find the hostname by running the command, **`nova service-list`**.
- The default values for most of the OpenStack processing workers numbers are bound to CPU cores. Such behavior works well when the system has matching memory size when compared to its CPU cores. There might be memory problems on Power Systems when many CPU cores are recognized by the operating system, and you have a relatively small amount of memory.

  Therefore, ensure the OpenStack services on the controller node are stopped before you run the in-place upgrade command. For multi nodes, you must run the script on each node to stop the services. For more information about stopping these services, see Restarting IBM Cloud Manager with OpenStack services.

  ```
  Create  cmwo_services.sh script and run sudo ./cmwo_services.sh 'CHANGEME_STOP_ORDER'  stop .

  set CHANGEME_STOP_ORDER to the following services list:
  openstack-nova-powervc
  openstack-glance-powervc
  openstack-cinder-powervc
  openstack-neutron-powervc
  openstack-ceilometer-alarm-evaluator
  ```

```
openstack-ceilometer-agent-notification
openstack-ceilometer-collector
openstack-ceilometer-central
openstack-ceilometer-api
openstack-heat-engine
openstack-heat-api-cloudwatch
openstack-heat-api-cfn
openstack-heat-api
openstack-cinder-scheduler
openstack-cinder-api
openstack-cinder-volume
openstack-nova-consoleauth
openstack-nova-novncproxy
openstack-nova-cert
openstack-nova-scheduler
openstack-nova-api
openstack-nova-conductor
neutron-dhcp-agent
neutron-openvswitch-agent
openstack-glance-registry
openstack-glance-api
openstack-keystone
```

Complete the following steps to upgrade in-place:

Procedure

1. Upgrade the deployment server from version 4.1 to version 4.2. To upgrade the deployment server, you must install IBM Cloud Manager with OpenStack, version 4.2 on a deployment server that already has version 4.1 installed. As a result, the installer upgrades the deployment server to the current release of the product. It is recommended that you back up the deployment server before you upgrade to the current release. For more information, see “Backing up and restoring the deployment server” on page 256.
2. Change the performance attributes in your environment file in order to customize settings for items such as the message queue and workers. After you complete the configuration changes, upload the environment JSON file.

   ```
   $ # Edit the environment JSON file, your-environment-name.json.
   $ knife environment from file your-environment-name.json
   ```

   For more information, see “Customizing performance attributes” on page 127.
3. The topology files that you used to deploy the nodes in IBM Cloud Manager with OpenStack 4.1 are required to complete the upgrade. Find them and confirm that the environment and topology in these files were not modified. If you lost the topology files, you must create a new topology file that depicts your OpenStack topology. For instructions to create a topology file, see “Deploying the cloud environment” on page 74.
4. If you are using the self-service portal with a DB2 database, you must upload the granted user password of your old database to the data bag, which is used to connect to the database in the self-service portal, version 4.1.
   a. Run **mkdir data_bags**.
   b. Update the following JSON attributes in your environment file, `your-environment-name.json`.
      - **openstack.developer_mode**: Set to *False*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.
      - **openstack.secret.key_path**: Set to */etc/chef/encrypted_data_bag_secret*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.

   c. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/inplace_upgrade_passwords data_bags/**.
   d. Run **chmod -R 600 data_bags/**.
   e. Change the value at *passwOrd* to the password in the `data_bags/inplace_upgrade_passwords/self_service_db2.json` file.

```
{
         "id": "self_service_db2",
         "self_service_db2": "passw0rd"
      }
```

f. Upload the data bag items for the passwords, the secret file is included in your topology file.

```
 $ knife data bag from file inplace_upgrade_passwords data_bags/inplace_upgrade_passwords/
self_service_db2.json --secret-file secret-file-name
```

g. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

5. If you are using VMware as the hypervisor and you have virtual machine disk (VMDK) as the block storage backend, you must upload the vCenter host password to the data bag before you upgrade the topology.

   a. Run **mkdir data_bags**.

   b. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/secrets/openstack_vmware_secret_name.json**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *CHANGEME* to the password in the data_bags/secrets/openstack_vmware_secret_name.json file.

```
{
  "id": "openstack_vmware_secret_name",
  "openstack_vmware_secret_name": "CHANGEME "
}
```

   e. Upload the data bag items for the passwords, the secret file is included in your topology file.

```
$ knife data bag from file self_service_paswords  data_bags/secrets/
openstack_vmware_secret_name.json --secret-file secret-file-name
```

   f. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

6. If you are using the Cinder z/VM driver, you must remove the role[ibm-os-zvm-block-storage-node] that is specified in the controller node runlist (inside the topology file).

7. If you are using the z/VM compute node, you must upload thez/VM **xcat mnadmin** password to your data bag.

   a. Run **mkdir data_bags**.

   b. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/xcatmnadmin.json data_bags/**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *OPENSTACK1* to the password of the user mnadmin in the xcat server, within the data_bags/xcatmnadmin.json file.

```
 {
        "id": "xcatmnadmin",
        "xcatmnadmin": "openstack1"
     }
```

   e. Upload the data bag item, your_env_user_passwords, which is the data bag name you created for **user_passwords**, in the secret file that is included in your topology file.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

```
 $ knife data bag from file your_env_user_passwords data_bags/xcatmnadmin.json --secret-file
secret-file-name
```

   f. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

8. Determine whether to use the **qpid** or rabbitmq option during the upgrade. The in-place upgrade from IBM Cloud Manager with OpenStack version 4.1 to 4.2 changes the message queue from qpid to rabbitmq, by default. If you do not want to change the message queue, you must use the in-place upgrade command with the --use-qpid option.

Notes:

- If you are not familiar with qpid and rabbitmq, do not use this option.
- If your controller node exists on the deployment server in version 4.1, then you must use the --use-qpid option to complete the upgrade. See the assumptions section at the beginning of this topic.

If you use --use-qpid, the updated topology uses qpid as the message queue. Otherwise, the message queue is replaced by rabbitmq automatically. Complete the following steps, depending on the message queue you want to use.

rabbitmq message queue (default)

To use the rabbitmq message queue, you must upload the client password for rabbitmq to your data bag before running the in-place upgrade command.

a. Run **mkdir data_bags**.

b. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/rabbitclient.json data_bags/**.

c. Run **chmod -R 600 data_bags/**.

d. Change the value at *OPENSTACK1* to the password of the user *rabbitclient* to communicate to rabbitmq, within the data_bags/rabbitclient.json file.

```
{
     "id": "rabbitclient",
     "rabbitclient": "openstack1"
   }
```

e. Upload the data bag item, *your_env_user_passwords*, which is the data bag name you created for **user_passwords**, in the secret file that is included in your topology file.

Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

```
$ knife data bag from file your_env_user_passwords data_bags/rabbitclient.json
--secret-file secret-file-name
```

f. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

qpid message queue

To continue to use the qpid message queue, use the --use-qpid option. For example, **knife os manage in place upgrade topology topology_file.json --use-qpid**.

9. If you are using the IBM Storwize Cinder driver, you must upload the SAN controller password to your data bag before you upgrade the topology.

a. If the user name of the SAN controller is *admin*, you must contact the SAN storage administrator to create a new user with a different name, and set the attribute **openstack.block-storage.san.san_login** in your environment file to the new user name. There is a limitation that you cannot use *admin* for the authentication between Cinder service and SAN storage.

```
$ knife environment edit your-environment-name
```

where *your-environment-name* is the environment in your topology.

b. Run **mkdir data_bags**.

c. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/admin.json data_bags/<san_login_username>.json**.

where *san_login_username* is the user name of the SAN controller. For example, if your SAN user name is *update_sanuser*, then you run the command **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/admin.json data_bags/update_sanuser.json**.

d. Run **chmod -R 600 data_bags/**.

e. Change the value at *openstack1* to the password of the SAN controller and change the value at *admin* to the user name of the SAN controller within the `data_bags/<san_login_username>.json` `file`. If you don't want to authenticate with the password, you can set the password to an empty value *""*.

   Note: The user name you specified here must be the same as **`openstack.block-storage.san.san_login`** in your environment.

   ```
   {
   "id": "admin",
   "admin": "openstack1"
   }
   ```

   For example, if your SAN user name is *update_sanuser*, then you change *"admin"* to *update_sanuser*, as follows:

   ```
   {
   "id": "update_sanuser",
   "update_sanuser": "openstack1"
   }
   ```

f. Upload the data bag item, **`your_env_user_passwords`**, which is the data bag name you created for **`user_passwords`**, the *secret-file-name* that is included in your topology file.

   ```
   $ knife data bag from file your_env_user_passwords data_bags/admin.json --secret-file secret-file-name
   ```

g. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

10. You must upload the *heat_stack_admin* password to your data bag for the OpenStack heat service.

    a. Run **`mkdir data_bags`**.

    b. Run **`cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/heat_stack_admin.json data_bags/`**.

    c. Run **`chmod -R 600 data_bags/`**.

    d. Change the value at `OPENSTACK1` to the keystone password of the user *heat_stack_admin*, within the `data_bags/heat_stack_admin.json` file.

    ```
    {
           "id": "heat_stack_admin",
           "heat_stack_admin": "openstack1"
    }
    ```

    e. Upload the data bag item, `your_env_user_passwords`, which is the data bag name you created for `user_passwords`, the secret file that is included in your topology file.

    Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

    ```
     $ knife data bag from file your_env_user_passwords  data_bags/heat_stack_admin.json
    --secret-file secret-file-name
    ```

    f. Remove the local data bag items since they are no longer needed.

    ```
    $ rm -rf data_bags/
    ```

11. Ensure the configuration for **`global_admin`** in the `/etc/keystone/policy.json` file on each node of your topology is as shown:

    ```
    "global_admin": "rule:admin_role or is_admin:1",
    ```

    If it is not, update and restart the Keystone service with the **`service openstack-keystone restart`** command. For more information, see “Upgrading a topology fails” on page 316.

12. Upgrade the topology deployment in-place.

    ```
    $ knife os manage in place upgrade topology your-topology-name.json
    ```

    Note: In IBM Cloud Manager with OpenStack version 4.1, if you configured your cloud topology to use the Open vSwitch plugin for networking (neutron.plugins.openvswitch.ovs_neutron_plugin.OVSNeutronPluginV2), the upgrade process migrates the OVS plugin to the ML2 plugin automatically for IBM Cloud Manager with OpenStack version 4.2. The Open vSwitch core plugin is not supported in the Juno release of OpenStack that is used in IBM Cloud Manager with OpenStack version 4.2. If the migration from OVS to ML2 is unexpectedly unsuccessful, the upgrade process restores the neutron database and aborts the upgrade process. For this failure, customer support is required. The migration from OVS to ML2 is only supported when using this command to upgrade the topology. The migration from OVS to ML2 is not supported when upgrading a single node.

All of the nodes that are defined in the topology are upgraded. This command provides two options to control the upgrade process:

--no-validation

This option indicates that when the nodes list or node runlist, that is identified in the topology file, conflicts with the list stored in the deployment Chef server, the upgrade should continue. Without this option, you are prompted whether to continue. By default, you are prompted to confirm.

Note: To avoid breaking the cloud unintentionally, you should retain the default setting that requires your confirmation.

Example:

```
$ knife os manage in place upgrade topology topology_file.json --no-validation
```

--use-qpid

With this option, the updated topology uses `qpid` as the message queue. Otherwise, the message queue is replaced by `rabbitmq`.

--topology-type TYPE

TYPE is the topology type of the deployed nodes. Its value must be 1-4:

Table 22. Topology type. The table displays the option values and associated topology types.

Option	Type	Description
1	*All-In-One topology*	This topology runs all IBM Cloud Manager with OpenStack services from one system.
2	*1 + N topology*	This topology provides a single controller node, plus any number (*n*) of compute nodes.
3	*1 + N distributed DB topology*	This topology is similar to the controller + *n* compute topology; however, it allows the IBM Cloud Manager with OpenStack database service to run on a separate compute node. It also supports advanced customization.
4	*1 + N distributed cinder topology*	This topology provides a cloud environment with extra block storage (Cinder) nodes.

You can use the command without specifying this option. In that case, the command tries to identify the topology by analyzing the topology file and checking the roles that are given to the nodes automatically. If the process fails, then the command exits and requests that you explicitly set the topology type.

Example:

```
$ knife os manage in place upgrade topology topology_file.json --topology-type 1
```

It means that the topology of nodes is the `Minimal` topology.

Here is an example of the running result:

```
$ knife os manage in place upgrade topology 39.json
 The following nodes: ["dhcp-10-1-3-43.sce.cn.ibm.com"]
have the same env with the topology are not in topology updated list.
 Do you want to continue to update all of the nodes
in the topology? (y/n)[y] y
 Back up file '/root/Updated-backup/env_39-env1407922391.json' saved.
 Back up file '/root/Updated-backup/
```

```
node_dhcp-10-1-3-39.sce.cn.ibm.com1407922391.json' succeeded.
 39-env: Chef environment has been updated.
 dhcp-10-1-3-39.sce.cn.ibm.com: Node has been updated.
 Update env attribute ibm-openstack.upgrade.inplace to true.
 Update env attribute ibm-openstack.upgrade.inplace to false.
 Upgrade complete!
 Updated attributes are:
 -----------------------------------
 Environment['39-env'] updated attributes:
 Update attribute['openstack.compute.rpc_backend'], value =
 'nova.openstack.common.rpc.impl_kombu'
     Delete attribute['inplace.update']
     Create attribute['openstact.test'], value = 'test'
 Node[dhcp-10-1-3-39.sce.cn.ibm.com] updated attributes:
 Updated totally 3 attributes.

-----------------------------------
```

What to do next

After the upgrade is finished, review the following information.

1. The environment and nodes information from the old topology is backed up. All back-up files are in the `Update-backup` folder in the same folder as the topology file you specified.
2. Rerunning this command is allowed. If the environment and nodes information is already backed up, and there are no more changes, the back-up action is not completed. The command tries to update the nodes only.
3. For the self-service portal, the old home directory is backed up. The default location is `/var/opt/ibm/.SCE41_no_delete/`, which cannot be removed as a backup of the old data.
4. If you disabled the IBM Platform Resource Scheduler service before the upgrade, enable **nova-ibm-ego-ha-service** on the controller node by running the following command:

   ```
   nova service-enable $controller-node nova-ibm-ego-ha-service
   ```

   where *$controller-node* is the hostname where the **nova-ibm-ego-ha-service** runs.

Upgrading a multi-region topology

You can upgrade your multi-region cloud environment from IBM Cloud Manager with OpenStack, version 4.1 to IBM Cloud Manager with OpenStack, version 4.2.

About this task

Before you begin, ensure that the following assumptions are true:

- The multi-region cloud environment (including PRS, PowerVC driver, z/VM driver, self-service portal, and so on) is deployed by the IBM Cloud Manager with OpenStack 4.1 deployment server, using Chef cookbooks, with the **knife os manage deploy topology xxx** command.
- The Chef server that is installed by the IBM Cloud Manager with OpenStack deployer in the deployment server must only be used to install IBM OpenStack, but cannot be used to run other cookbooks for any other purposes. You must not change the environment or runlist assigned to any nodes.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must add the `--use-qpid` option when you run the upgrade command. It is unsupported to switch the message queue from `qpid` to `rabbitmq` in this configuration.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must check the file permission for `/var/log/cinder/cinder.log` on the

controller node and cinder node. The file permission must be cinder:cinder. If the file permission is root:root, you need to run **chown cinder:cinder /var/log/cinder/cinder.log** to change the file permission.

- The default values for most of the OpenStack processing workers numbers are bound to CPU cores. Such behavior works well when the system has matching memory size when compared to its CPU cores. There might be memory problems on Power Systems when many CPU cores are recognized by the operating system, and you have a relatively small amount of memory.

  Therefore, ensure the OpenStack services on the controller node are stopped before you run the in-place upgrade command. For multi nodes, you must run the script on each node to stop the services. For more information about stopping these services, see Restarting IBM Cloud Manager with OpenStack services.

  ```
  Create  cmwo_services.sh script and run sudo ./cmwo_services.sh 'CHANGEME_STOP_ORDER'  stop .

  set CHANGEME_STOP_ORDER to the following services list:
  openstack-nova-powervc
  openstack-glance-powervc
  openstack-cinder-powervc
  openstack-neutron-powervc
  openstack-ceilometer-alarm-evaluator
  openstack-ceilometer-agent-notification
  openstack-ceilometer-collector
  openstack-ceilometer-central
  openstack-ceilometer-api
  openstack-heat-engine
  openstack-heat-api-cloudwatch
  openstack-heat-api-cfn
  openstack-heat-api
  openstack-cinder-scheduler
  openstack-cinder-api
  openstack-cinder-volume
  openstack-nova-consoleauth
  openstack-nova-novncproxy
  openstack-nova-cert
  openstack-nova-scheduler
  openstack-nova-api
  openstack-nova-conductor
  neutron-dhcp-agent
  neutron-openvswitch-agent
  openstack-glance-registry
  openstack-glance-api
  openstack-keystone
  ```

This example uses two regions for the multi-region cloud environment; however, upgrading also works if you have more than two regions. This example also uses a single deployment server to manage all of the regions. However, upgrading works if you have a separate deployment server for each region.

Complete the following steps to upgrade the deployed multi-region topology in-place:

Procedure

1. Upgrade the deployment server from version 4.1 to version 4.2. To upgrade the deployment server, you must install IBM Cloud Manager with OpenStack, version 4.2 on a deployment server that already has version 4.1 installed. As a result, the installer upgrades the deployment server to the current release of the product. It is recommended that you back up the deployment server before you upgrade to the current release. For more information, see "Backing up and restoring the deployment server" on page 256.
2. Change the performance attributes in your environment file in order to customize settings for items such as the message queue and workers. After you complete the configuration changes, upload the environment JSON file.

   ```
   $ # Edit the environment JSON file, your-environment-name.json.
   $ knife environment from file your-environment-name.json
   ```

For more information, see "Customizing performance attributes" on page 127.

3. The topology files that you used to deploy the regions in IBM Cloud Manager with OpenStack 4.1 are required to complete the upgrade. Each region should have a separate topology file. Find the files and confirm that the environment and topology in these files were not modified. If you lost the topology files, you must create new topology files that depict your multi-region topology. For information on creating topology files for each region, see "Deploying multi-region support" on page 104.
4. Complete the subsequent steps for each region. You must complete the in-place upgrade procedure for each region separately.
5. If you are using the self-service portal with a DB2 database, you must upload the granted user password of your old database to the data bag, which is used to connect to the database in the self-service portal, version 4.1.
   a. Run **mkdir data_bags**.
   b. Update the following JSON attributes in your environment file, `your-environment-name.json`.
      - **openstack.developer_mode**: Set to *False*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.
      - **openstack.secret.key_path**: Set to */etc/chef/encrypted_data_bag_secret*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.
   c. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/inplace_upgrade_passwords data_bags/**.
   d. Run **chmod -R 600 data_bags/**.
   e. Change the value at *passwOrd* to the password in the `data_bags/inplace_upgrade_passwords/self_service_db2.json` file.
      ```
      {
               "id": "self_service_db2",
               "self_service_db2": "passw0rd"
            }
      ```
   f. Upload the data bag items for the passwords, the secret file is included in your topology file.
      ```
       $ knife data bag from file inplace_upgrade_passwords data_bags/inplace_upgrade_passwords/
      self_service_db2.json --secret-file secret-file-name
      ```
   g. Remove the local data bag items since they are no longer needed.
      ```
      $ rm -rf data_bags/
      ```
6. If you are using VMware as the hypervisor and you have virtual machine disk (VMDK) as the block storage backend, you must upload the vCenter host password to the data bag before you upgrade the topology.
   a. Run **mkdir data_bags**.
   b. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/secrets/openstack_vmware_secret_name.json**.
   c. Run **chmod -R 600 data_bags/**.
   d. Change the value at *CHANGEME* to the password in the `data_bags/secrets/openstack_vmware_secret_name.json` file.
      ```
      {
        "id": "openstack_vmware_secret_name",
        "openstack_vmware_secret_name": "CHANGEME "
      }
      ```
   e. Upload the data bag items for the passwords, the secret file is included in your topology file.
      ```
      $ knife data bag from file self_service_paswords  data_bags/secrets/
      openstack_vmware_secret_name.json --secret-file secret-file-name
      ```
   f. Remove the local data bag items since they are no longer needed.
      ```
      $ rm -rf data_bags/
      ```
7. If you are using the Cinder z/VM driver, you must remove the `role[ibm-os-zvm-block-storage-node]` that is specified in the controller node runlist (inside the topology file).

8. If you are using the z/VM compute node, you must upload thez/VM **xcat mnadmin** password to your data bag.

   a. Run **mkdir data_bags**.

   b. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/xcatmnadmin.json data_bags/**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *OPENSTACK1* to the password of the user mnadmin in the xcat server, within the data_bags/xcatmnadmin.json file.

   ```
   {
           "id": "xcatmnadmin",
           "xcatmnadmin": "openstack1"
        }
   ```

   e. Upload the data bag item, your_env_user_passwords, which is the data bag name you created for **user_passwords**, in the secret file that is included in your topology file.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
    $ knife data bag from file your_env_user_passwords data_bags/xcatmnadmin.json --secret-file
   secret-file-name
   ```

   f. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

9. Determine whether to use the **qpid** or rabbitmq option during the upgrade. The in-place upgrade from IBM Cloud Manager with OpenStack version 4.1 to 4.2 changes the message queue from qpid to rabbitmq, by default. If you do not want to change the message queue, you must use the in-place upgrade command with the --use-qpid option.

   Notes:

   - If you are not familiar with qpid and rabbitmq, do not use this option.
   - If your controller node exists on the deployment server in version 4.1, then you must use the --use-qpid option to complete the upgrade. See the assumptions section at the beginning of this topic.

   If you use --use-qpid, the updated topology uses qpid as the message queue. Otherwise, the message queue is replaced by rabbitmq automatically. Complete the following steps, depending on the message queue you want to use.

   rabbitmq message queue (default)

   To use the rabbitmq message queue, you must upload the client password for rabbitmq to your data bag before running the in-place upgrade command.

   a. Run **mkdir data_bags**.

   b. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/rabbitclient.json data_bags/**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *OPENSTACK1* to the password of the user *rabbitclient* to communicate to rabbitmq, within the data_bags/rabbitclient.json file.

   ```
   {
        "id": "rabbitclient",
        "rabbitclient": "openstack1"
      }
   ```

   e. Upload the data bag item, *your_env_user_passwords*, which is the data bag name you created for **user_passwords**, in the secret file that is included in your topology file.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

```
$ knife data bag from file your_env_user_passwords data_bags/rabbitclient.json
--secret-file secret-file-name
```

f. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

qpid message queue

To continue to use the `qpid` message queue, use the `--use-qpid` option. For example, **`knife os manage in place upgrade topology topology_file.json --use-qpid`**.

10. If you are using the IBM Storwize Cinder driver, you must upload the SAN controller password to your data bag before you upgrade the topology.

a. If the user name of the SAN controller is *admin*, you must contact the SAN storage administrator to create a new user with a different name, and set the attribute **`openstack.block-storage.san.san_login`** in your environment file to the new user name. There is a limitation that you cannot use *admin* for the authentication between Cinder service and SAN storage.

```
$ knife environment edit your-environment-name
```

where *your-environment-name* is the environment in your topology.

b. Run **`mkdir data_bags`**.

c. Run **`cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/admin.json data_bags/<san_login_username>.json`**.

where *san_login_username* is the user name of the SAN controller. For example, if your SAN user name is *update_sanuser*, then you run the command **`cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/admin.json data_bags/update_sanuser.json`**.

d. Run **`chmod -R 600 data_bags/`**.

e. Change the value at *openstack1* to the password of the SAN controller and change the value at *admin* to the user name of the SAN controller within the `data_bags/<san_login_username>.json file`. If you don't want to authenticate with the password, you can set the password to an empty value ″″.

Note: The user name you specified here must be the same as **`openstack.block-storage.san.san_login`** in your environment.

```
{
"id": "admin",
"admin": "openstack1"
}
```

For example, if your SAN user name is *update_sanuser*, then you change *″admin″* to *update_sanuser*, as follows:

```
{
"id": "update_sanuser",
"update_sanuser": "openstack1"
}
```

f. Upload the data bag item, **`your_env_user_passwords`**, which is the data bag name you created for **`user_passwords`**, the *secret-file-name* that is included in your topology file.

```
$ knife data bag from file your_env_user_passwords data_bags/admin.json --secret-file secret-file-name
```

g. Remove the local data bag items since they are no longer needed.

```
$ rm -rf data_bags/
```

11. You must upload the *heat_stack_admin* password to your data bag for the OpenStack heat service.

a. Run **`mkdir data_bags`**.

b. Run **`cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/heat_stack_admin.json data_bags/`**.

c. Run **`chmod -R 600 data_bags/`**.

d. Change the value at `OPENSTACK1` to the keystone password of the user *heat_stack_admin*, within the `data_bags/heat_stack_admin.json` file.

```
{
       "id": "heat_stack_admin",
       "heat_stack_admin": "openstack1"
}
```

e. Upload the data bag item, `your_env_user_passwords`, which is the data bag name you created for `user_passwords`, the secret file that is included in your topology file.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
    $ knife data bag from file your_env_user_passwords  data_bags/heat_stack_admin.json
   --secret-file secret-file-name
   ```

f. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

12. Ensure the configuration for **`global_admin`** in the `/etc/keystone/policy.json` file on each node of your topology is as shown:

    ```
    "global_admin": "rule:admin_role or is_admin:1",
    ```

    If it is not, update and restart the Keystone service with the **`service openstack-keystone restart`** command. For more information, see “Upgrading a topology fails” on page 316.

13. Update your environment. Set **`openstack.auth.strategy`** to `uuid`.

14. Upgrade the topology in place.

    ```
    $ knife os manage in place upgrade topology your-topology-name.json
    ```

    All of the nodes that are defined in the topology are upgraded. This command provides two options to control the upgrade process:

    --no-validation

    This option indicates that when the nodes list or node runlist, that is identified in the topology file, conflicts with the list stored in the deployment Chef server, the upgrade should continue. Without this option, you are prompted whether to continue. By default, you are prompted to confirm.

    Note: To avoid breaking the cloud unintentionally, you should retain the default setting that requires your confirmation.

    Example:

    ```
    $ knife os manage in place upgrade topology topology_file.json --no-validation
    ```

    --use-qpid

    With this option, the updated topology uses `qpid` as the message queue. Otherwise, the message queue is replaced by `rabbitmq`.

    --topology-type TYPE

    TYPE is the topology type of the deployed nodes. Its value must be 1-4:

Table 23. Topology type. The table displays the option values and associated topology types.

Option	Type	Description
1	*All-In-One topology*	This topology runs all IBM Cloud Manager with OpenStack services from one system.
2	*1 + N topology*	This topology provides a single controller node, plus any number (*n*) of compute nodes.
3	*1 + N distributed DB topology*	This topology is similar to the controller + *n* compute topology; however, it allows the IBM Cloud Manager with OpenStack database service to run on a separate compute node. It also supports advanced customization.
4	*1 + N distributed cinder topology*	This topology provides a cloud environment with extra block storage (Cinder) nodes.

You can use the command without specifying this option. In that case, the command tries to identify the topology by analyzing the topology file and checking the roles that are given to the nodes automatically. If the process fails, then the command exits and requests that you explicitly set the topology type.

Example:

```
$ knife os manage in place upgrade topology topology_file.json --topology-type 2
```

It means that the topology of the nodes is the *1 + N topology* topology.

15. If you have any regions that were upgraded without using the `--use-qpid` option, and you are using the self-service portal to manage IBM Cloud Manager with OpenStack, there is an extra requirement. After you complete the preceding steps for each region, you must change the message queue from `qpid` to `rabbitmq` on the self-service portal. For instructions on how to change the message queue option in the self-service portal, see "Changing the message queue option" on page 236.

    Note: You do not need to do anything with the region whose controller node was installed on the same server as the self-service portal. The region is in `OK` state on the self-service portal because the message queue for this region is automatically changed to `rabbitmq` during the in-place upgrade command process.

What to do next

After the upgrade is finished, review the following information.

1. The environment and nodes information from the old topology is backed up. All back-up files are in the `Update-backup` folder in the same folder as the topology file you specified.
2. Rerunning this command is allowed. If the environment and nodes information is already backed up, and there are no more changes, the back-up action is not completed. The command tries to update the nodes only.
3. For the self-service portal, the old home directory is backed up. The default location is `/var/opt/ibm/.SCE41_no_delete/`, which cannot be removed as a backup of the old data.
4. If you disabled the IBM Platform Resource Scheduler service before the upgrade, enable **nova-ibm-ego-ha-service** on the controller node by running the following command:

   ```
   nova service-enable $controller-node nova-ibm-ego-ha-service
   ```

   where *$controller-node* is the hostname where the **nova-ibm-ego-ha-service** runs.

Upgrading the stand-alone self-service portal

You can migrate your IBM Cloud Manager with OpenStack self-service portal configuration and data from IBM Cloud Manager with OpenStack, version 4.1 to IBM Cloud Manager with OpenStack, version 4.2.

About this task

Use these instructions only for upgrading a stand-alone self-service portal topology. If you deploy the stand-alone self-service portal with any other IBM Cloud Manager with OpenStack topology, such as minimal, controller + n compute, distributed database, or distributed by using Cinder driver configuration, see "Upgrading the topology" on page 45.

Upgrading the stand-alone self-service portal topology when using Derby

If you are using the self-service portal with a Derby database, use these instructions to migrate your data and configuration.

About this task

Before you begin, ensure that the following assumptions are true:

- The self-service portal environment is deployed by IBM Cloud Manager with OpenStack 4.1 deployment server, using chef cookbooks, with the **knife os manage deploy topology TOPOLOGY_FILE_NAME** command.
- The Chef server that is installed by the IBM Cloud Manager with OpenStack deployer in the deployment server must only be used to install IBM OpenStack, but cannot be used to run other cookbooks for any other purposes. You must not change the environment or runlist assigned to any nodes.

Complete the following steps to upgrade the self-service portal node in-place. You might have deployed the self-service portal node by using the knife topology or node command.

Procedure

1. Upgrade the deployment server from version 4.1 to version 4.2. To upgrade the deployment server, you must install IBM Cloud Manager with OpenStack, version 4.2 on a deployment server that already has version 4.1 installed. As a result, the installer upgrades the deployment server to the current release of the product. It is recommended that you back up the deployment server before you upgrade to the current release. For more information, see “Backing up and restoring the deployment server” on page 256.
2. Upgrade the topology deployment in-place.

   ```
   $ knife os manage in place upgrade topology your-topology-name.json
   ```

   The node is upgraded. this command provides two options to control the upgrade process:

   --no-validation

   This option indicates that when the nodes list or node runlist that is in the topology file conflicts with the list stored in the deployment Chef server, the upgrade should continue. Without this option, you are prompted whether to continue. By default, you are prompted to confirm.

   Note: To avoid breaking the cloud unintentionally, retain the default setting that requires your confirmation.
   Example:

   ```
   $ knife os manage in place upgrade topology topology_file.json --no-validation
   ```

   --topology-type TYPE

   TYPE is the topology type of the deployed nodes. Its value must be 1-5:

Table 24. Topology type. The table displays the option values and associated topology types.

Option	Type	Description
1	*All-In-One topology*	This topology runs all IBM Cloud Manager with OpenStack services from one system.
2	*1 + N topology*	This topology provides a single controller node, plus any number (*n*) of compute nodes.
3	*1 + N distributed DB topology*	This topology is similar to the controller + *n* compute topology; however, it allows the IBM Cloud Manager with OpenStack database service to run on a separate compute node. It also supports advanced customization.
4	*1 + N distributed cinder topology*	This topology provides a cloud environment with extra block storage (Cinder) nodes.
5	*Stand-alone self-service portal topology*	This topology provides a self-service portal node used ONLY to manage VMware clouds.

You can use the command without specifying this option. In that case, the command tries to identify the topology by analyzing the topology file and checking the roles that are given to the nodes automatically. If the process fails, then the command exits and requests that you explicitly set the topology type.

Example:

```
$ knife os manage in place upgrade topology topology_file.json --topology-type 5
```

It means that the topology of nodes is the `Stand-alone self-service portal topology`.

What to do next

After the upgrade is finished, review the following information.

1. The environment and nodes information from the old topology is backed up. All back-up files are in the `Update-backup` folder in the same folder as the topology file you specified.
2. Rerunning this command is allowed. If the environment and nodes information is already backed up, and there are no more changes, the back-up action is not completed. The command tries to update the nodes only.
3. For the self-service portal, the old home directory is backed up. The default location is `/var/opt/ibm/.SCE41_no_delete/`, which cannot be removed as a backup of the old data.

Upgrading the stand-alone self-service portal topology when using DB2

If you are using the self-service portal with a DB2 database, use these instructions to manually migrate your data and configuration.

Before you begin

When you migrate data in the self-service portal, you must migrate sequentially. You cannot skip a version. For example, if you want to migrate IBM SmartCloud Entry version 3.2 to IBM Cloud Manager with OpenStack version 4.2, you must migrate from version 3.2 to version 4.1 first.

About this task

Before you migrate to the latest version, ensure that all available fix packs are applied. Then, migrate from IBM Cloud Manager with OpenStack self-service portal version 4.1 (with fix packs) to version 4.2.

Complete the following steps to migrate your IBM Cloud Manager with OpenStack self-service portal configuration and data to a new version.

Procedure

1. Stop IBM Cloud Manager with OpenStack self-service portal 4.1 by running the following command:
   ```
   service sce stop
   ```
2. Back up the `/var/opt/ibm/.SCE41` folder on the self-service portal node as the migration source folder:
   ```
   # cp -rfp /var/opt/ibm/.SCE41/ /var/opt/ibm/.SCE41_no_delete/
   ```

   Important: Ensure that the backup process successfully completed before you continue with the next step to uninstall IBM Cloud Manager with OpenStack self-service portal 4.1. If the backup is not finished before you uninstall, then configuration and data for self-service portal 4.1 is lost.
3. Uninstall the IBM Cloud Manager with OpenStack self-service portal 4.1 by running the following command:
   ```
   # knife os manage deploy node node.fqdn.com recipe[ibm-sce::uninstall] -P node-ssh-password -E node-environment
   ```

   where

- *node.fqdn.com* is the fully qualified domain name for the self-service portal node
- *node-ssh-password* is the ssh password for the self-service portal node
- *node-environment* is the chef environment for the self-service portal node

Example:

```
knife os manage deploy node hostname.my.company.com recipe[ibm-sce::uninstall] -P passw0rd -E your-environment-name
```

4. Install self-service portal 4.2. For more information, see "Stand-alone self-service portal for managing VMware clouds" on page 108.
5. To migrate all of your preferences from one set of configuration files to the new set, run the following OSGi command:

   ```
   migrateConfig source_directory
   ```

   where *source_directory* is the location of the previous IBM Cloud Manager with OpenStack self-service portal release configuration files. Ensure that the owner of the source directory is the same as the owner of the self-service portal service when you migrate the configuration.

   Running this command migrates the following configuration files:
   - `cfs.keystone`
   - `ldap.xml`
   - `deployment.properties`
   - `authentication.properties` (**`admin.name`** is not updated by the command.)
   - `email.properties`
   - `messaging.properties`
   - `metering.properties`
   - `billing.properties`
   - `web.properties`
   - `*.jks`
   - `products/*.xml`
   - `server_rules.json`
   - `openstack.properties`
   - `Server.properties`
6. To migrate data from your previous database, complete the following steps:
   a. Ensure that the target database exists.

   b. In your browser, log out and close all open self-service portal windows.

   c. Run the following OSGi command:

   ```
   upgradeDatabase 'DB_Path' 'DB2_User_Name' 'DB2_password'
   ```

   where *DB_Path* is the path of the database, *DB2_User_Name* is the name of the DB2 administrator, and *DB2_password* is the password for the DB2 administrator.

   Note: *DB2_User_Name* and *DB2_password* are only needed when migrating data from a DB2 database.

   For example, to migrate your data from a DB2 database, run the following command:

   ```
   upgradeDatabase '//localhost:50001/ssp41''db2admin' 'db2passwd'
   ```

   For example, to migrate your data from a Derby database, run the following command:

   ```
   upgradeDatabase '/var/opt/ibm/.SCE41_no_delete/'
   ```

   Considerations:
   - The **`upgradeDatabase`** command supports only major versions of databases.
   - The source database must be Derby or DB2.

- Only approved requests can be migrated, while others such as pending requests, rejected requests, and withdrawn requests cannot be migrated. If the approved-requests related instances are deleted, they cannot be migrated either.
- Before you migrate the IBM Cloud Manager with OpenStack self-service portal 4.1 data, wait 5 minutes after you start IBM Cloud Manager with OpenStack self-service portal 4.2, to ensure that the database is fully initialized.
- If any errors occur during migration, renew the target database and run the **upgradeDatabase** command again.

7. Restart the self-service portal by running the following command:

   ```
   service sce restart
   ```

8. You must migrate some configuration information manually. This information includes your network configuration and the logging.properties file.

   Note: When you migrate configuration information for a Microsoft Windows 2008 installation, you must manually configure the cloud connection.

Upgrading a single node

You can complete an in-place upgrade for a single node from IBM Cloud Manager with OpenStack, version 4.1 to IBM Cloud Manager with OpenStack, version 4.2.

About this task

Upgrade support is provided for all the IBM Cloud Manager with OpenStack topologies: `Minimal`, `controller + n compute`, `distributed database`, and distributed using Cinder driver configuration.

Before you begin, ensure that the following assumptions are true:

- The cloud environment (including PRS, PowerVC driver, z/VM driver, self-service portal, and so on) is deployed by the IBM Cloud Manager with OpenStack 4.1 deployment server, using Chef cookbooks, with the **knife os manage deploy topology xxx** command.
- The Chef server that is installed by the IBM Cloud Manager with OpenStack deployer in the deployment server must only be used to install IBM OpenStack, but cannot be used to run other cookbooks for any other purposes. You must not change the environment or runlist assigned to any nodes.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must add the `--use-qpid` option when you run the upgrade command. It is unsupported to switch the message queue from `qpid` to `rabbitmq` in this configuration.
- If you deployed the controller node together with the deployment server node in IBM Cloud Manager with OpenStack version 4.1, you must check the file permission for `/var/log/cinder/cinder.log` on the controller node and cinder node. The file permission must be `cinder:cinder`. If the file permission is `root:root`, you need to run **chown cinder:cinder /var/log/cinder/cinder.log** to change the file permission.
- If you deployed the self-service portal and are using a distributed DB2 connection in IBM Cloud Manager with OpenStack version 4.1, you must complete the instructions in the “Upgrading the topology” on page 45 topic instead of proceeding with the following steps.

Complete the following steps to upgrade the single node in-place. You might have deployed the single node using the **knife** topology or node command.

Procedure

1. Upgrade the deployment server from version 4.1 to version 4.2. To upgrade the deployment server, you must install IBM Cloud Manager with OpenStack, version 4.2 on a deployment server that already has version 4.1 installed. As a result, the installer upgrades the deployment server to the

current release of the product. It is recommended that you back up the deployment server before you upgrade to the current release. For more information, see “Backing up and restoring the deployment server” on page 256.

2. If you are using the self-service portal with a DB2 database, you must upload the granted user password of your old database to the data bag, which is used to connect to the database in the self-service portal, version 4.1.

   a. Run **mkdir data_bags**.

   b. Update the following JSON attributes in your environment file, `your-environment-name.json`.

   - **openstack.developer_mode**: Set to *False*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.
   - **openstack.secret.key_path**: Set to */etc/chef/encrypted_data_bag_secret*. Only use this setting for the `Minimal` (all-in-one) environment. The default existed in the other environment.

   c. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/inplace_upgrade_passwords data_bags/**.

   d. Run **chmod -R 600 data_bags/**.

   e. Change the value at *passwOrd* to the password in the `data_bags/inplace_upgrade_passwords/self_service_db2.json` file.

   ```
    {
            "id": "self_service_db2",
            "self_service_db2": "passw0rd"
          }
   ```

   f. Upload the data bag items for the passwords, the secret file is included in your topology file.

   ```
    $ knife data bag from file inplace_upgrade_passwords data_bags/inplace_upgrade_passwords/
   self_service_db2.json --secret-file secret-file-name
   ```

   g. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

3. If you are using VMware as the hypervisor and you have virtual machine disk (VMDK) as the block storage backend, you must upload the vCenter host password to the data bag before you upgrade the topology.

   a. Run **mkdir data_bags**.

   b. Run **cp -r /opt/ibm/cmwo/chef-repo/data_bags/secrets/openstack_vmware_secret_name.json**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *CHANGEME* to the password in the `data_bags/secrets/openstack_vmware_secret_name.json` file.

   ```
   {
     "id": "openstack_vmware_secret_name",
     "openstack_vmware_secret_name": "CHANGEME "
   }
   ```

   e. Upload the data bag items for the passwords, the secret file is included in your topology file.

   ```
   $ knife data bag from file self_service_paswords  data_bags/secrets/
   openstack_vmware_secret_name.json --secret-file secret-file-name
   ```

   f. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

4. If you are using the z/VM compute node, you must upload thez/VM **xcat mnadmin** password to your data bag.

   a. Run **mkdir data_bags**.

   b. Run **cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/xcatmnadmin.json data_bags/**.

   c. Run **chmod -R 600 data_bags/**.

   d. Change the value at *OPENSTACK1* to the password of the user `mnadmin` in the xcat server, within the `data_bags/xcatmnadmin.json` file.

```
{
        "id": "xcatmnadmin",
        "xcatmnadmin": "openstack1"
     }
```

e. Upload the data bag item, `your_env_user_passwords`, which is the data bag name you created for **`user_passwords`**, in the secret file that is included in your topology file.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
    $ knife data bag from file your_env_user_passwords data_bags/xcatmnadmin.json --secret-file
   secret-file-name
   ```

f. Remove the local data bag items since they are no longer needed.

   ```
   $ rm -rf data_bags/
   ```

5. Determine whether to use the **`qpid`** or `rabbitmq` option during the upgrade. The in-place upgrade from IBM Cloud Manager with OpenStack version 4.1 to 4.2 changes the message queue from `qpid` to `rabbitmq`, by default. If you do not want to change the message queue, you must use the in-place upgrade command with the `--use-qpid` option.

   Note: If you are not familiar with `qpid` and `rabbitmq`, do not use this option.

   If you use `--use-qpid`, the updated topology uses `qpid` as the message queue. Otherwise, the message queue is replaced by `rabbitmq` automatically. Complete the following steps, depending on the message queue you want to use.

   rabbitmq message queue (default)

   To use the `rabbitmq` message queue, you must upload the client password for `rabbitmq` to your data bag before running the in-place upgrade command.

   a. Run **`mkdir data_bags`**.

   b. Run **`cp /opt/ibm/cmwo/chef-repo/data_bags/user_passwords/rabbitclient.json data_bags/`**.

   c. Run **`chmod -R 600 data_bags/`**.

   d. Change the value at *OPENSTACK1* to the password of the user *rabbitclient* to communicate to `rabbitmq`, within the `data_bags/rabbitclient.json` file.

      ```
      {
           "id": "rabbitclient",
           "rabbitclient": "openstack1"
         }
      ```

   e. Upload the data bag item, *your_env_user_passwords*, which is the data bag name you created for **`user_passwords`**, in the secret file that is included in your topology file.

      Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

      ```
      $ knife data bag from file your_env_user_passwords data_bags/rabbitclient.json
      --secret-file secret-file-name
      ```

   f. Remove the local data bag items since they are no longer needed.

      ```
      $ rm -rf data_bags/
      ```

   qpid message queue

   To continue to use the `qpid` message queue, use the `--use-qpid` option. For example, **`knife os manage in place upgrade node your-node-fqdn --use-qpid`**.

6. Upgrade the node deployment in-place.

   ```
   $ knife os manage in place upgrade node your-node-fqdn -x ssh-user -P ssh-password
   ```

   The node is upgraded. This command provides options to control the upgrade process:

--use-qpid

With this option, the updated topology uses `qpid` as the message queue. Otherwise, the message queue is replaced by `rabbitmq`.

--topology-type TYPE

TYPE is the topology type of the deployed nodes. Its value must be 1-4:

a. *All-In-One topology*

b. *1 + N topology*

c. *1 + N distributed DB topology*

d. *1 + N distributed cinder topology*

You can use the command without specifying this option. In that case, the command tries to identify the topology by analyzing the topology file and checking the roles that are given to the nodes automatically. If the process fails, then the command exits and requests that you explicitly set the topology type.

Example:

```
$ knife os manage in place upgrade node your-node-fqdn -x ssh-user -P ssh-password --topology-type 1
```

It means that the topology of nodes is the `Minimal` topology.

What to do next

After the upgrade is finished, review the following information.

1. The environment and nodes information from the old topology is backed up. All back-up files are in the `Update-backup` folder in the same folder as the topology file you specified.
2. Rerunning this command is allowed. If the environment and nodes information is already backed up, and there are no more changes, the back-up action is not completed. The command tries to update the nodes only.
3. For the self-service portal, the old home directory is backed up. The default location is `/var/opt/ibm/.SCE41_no_delete/`, which cannot be removed as a backup of the old data.
4. If you disabled the IBM Platform Resource Scheduler service before the upgrade, enable **`nova-ibm-ego-ha-service`** on the controller node by running the following command:

   ```
   nova service-enable $controller-node nova-ibm-ego-ha-service
   ```

   where *$controller-node* is the hostname where the **`nova-ibm-ego-ha-service`** runs.

Important: Repeat step 6 onward for each node that you must upgrade in place.

Upgrading the PowerVC controller and nodes

You can complete an in-place upgrade for IBM Cloud Manager with OpenStack, PowerVC controller and nodes from version 4.1 to version 4.2.

Before you begin

Before you begin, review the following information.

- Your PowerVC nodes must remain at level 1.2.1 or lower before you upgrade the IBM Cloud Manager with OpenStack PowerVC controller node.
- You cannot upgrade PowerVC using the IBM Cloud Manager with OpenStack in place upgrade. To upgrade PowerVC from version 1.2.1 to 1.2.2, see the PowerVC product information in IBM Knowledge Center.

About this task

To upgrade the PowerVC controller node and PowerVC node, complete the following steps.

Procedure

1. Upgrade the IBM Cloud Manager with OpenStack PowerVC controller node from version 4.1 to 4.2. For instructions, see “Upgrading the topology” on page 45.
2. Upgrade PowerVC from version 1.2.1 to version 1.2.2. For instructions, see the PowerVC product information.
3. Update the IBM Cloud Manager with OpenStack PowerVC controller node version 4.2 configuration for PowerVC version 1.2.2.
   a. Export the version 4.2 environment after the IBM Cloud Manager with OpenStack upgrade to version 4.2 is complete.
      ```
      knife environment show your-environment-name -d -Fjson > your-environment-name.json
      ```
   b. Update the Chef environment file and data bags. Prepare PowerVC 1.2.2 rabbit client ssl key/certificates, as described in steps 4-7 and step 9 in the “Deploying an advanced configuration to manage to PowerVC” on page 101 topic.
   c. Update your PowerVC controller node configuration for PowerVC version 1.2.2. For instructions, see “Updating a deployed topology” on page 149.

Upgrading the IBM Cloud Manager with OpenStack Hyper-V Agent

You can upgrade the IBM Cloud Manager with OpenStack Hyper-V Agent by using the graphical installation wizard or silently.

Note: You must upgrade the Hyper-V Agent one version at a time. For example, if you have Hyper-V Agent version 3.1, FP2 installed, you must upgrade to version 3.2 and then upgrade to version 3.2, FP1. However, if you want to upgrade the Hyper-V agent to IBM Cloud Manager with OpenStack version 4.1, you must upgrade directly from IBM SmartCloud Entry version 3.2, FP2 to IBM Cloud Manager with OpenStack version 4.1, FP1. If you upgrade the Hyper-V agent from IBM SmartCloud Entry version 3.2, FP2 to IBM Cloud Manager with OpenStack version 4.1 without installing FP1 for version 4.1, you are likely to encounter a problem.

Attention: During a graphical installation of the Hyper-V agent, if you provide a user name in the `Nova compute service user` field on the "Hyper-V Live Migration Settings" window, the IBM Cloud Manager with OpenStack Compute Service runs using the domain user. In this case, after you upgrade, you must complete the following steps to ensure that the instances can support live migration successfully on the Hyper-V compute node.

1. Open **Control Panel** -> **Administrative Tools** -> **Services**.
2. Locate the service that is named `IBM Cloud Manager with OpenStack Compute Service`, right-click, and select the **properties** menu.
3. Switch to the **Log On** tab, select the second option for `Log on as` and provide the domain user account and password.
4. Click **Apply** and **OK**.
5. Locate the service that is named `IBM Cloud Manager with OpenStack Compute Service`, right-click, and select **Restart** to restart the service.

Graphical Upgrade

To upgrade the IBM Cloud Manager with OpenStack Hyper-V Agent by using the graphical installation wizard, follow these steps:

Procedure

1. Download the latest fix for the IBM Cloud Manager with OpenStack Hyper-V Agent from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent and IBM Cloud Manager with OpenStack must be at the same level, either the GA level, or the fix level.
2. Locate the installation image, and double-click **IBM Cloud Manager with OpenStack Hyper-V Agent.msi** to start the installation wizard.
3. Follow the instructions that are provided by the installation wizard. For example, you must agree to the license terms and specify configuration information, such as target directory, basic nova and virtual switch configuration information, and message queue information. The IBM Cloud Manager with OpenStack Hyper-V Agent supports two message queue types: Qpid and RabbitMQ. When you upgrade the Hyper-V Agent to 4.2, select Qpid or RabbitMQ as the message queue, depending on your controller.
4. After you complete the information in the installation wizard, the upgrade begins.

Silent upgrade

To upgrade IBM Cloud Manager with OpenStack Hyper-V Agent silently, follow these steps:

Before you begin

Procedure

1. Download the latest fix for the IBM Cloud Manager with OpenStack Hyper-V Agent from Fix Central. For more information, see "Getting fixes from Fix Central" on page 297.

   Note: The IBM Cloud Manager with OpenStack Hyper-V Agent and IBM Cloud Manager with OpenStack must be at the same level, either the GA level, or the fix level.
2. To run the installation through the response file, you must first enter the correct parameters in your locally saved copy of the response file. For detailed information, see the sample response files.

   The sample response files provide example INI files that can be used to drive a silent installation. This Qpid Sample Response File upgrades the Hyper-V Agent using Qpid as the message queue. The RabbitMQ Sample Response File upgrades the Hyper-V Agent using RabbitMQ as the message queue. The two examples show all properties that are available during a graphical installation of the IBM Cloud Manager with OpenStack Hyper-V Agent.**Qpid Sample Response File**

   ```
   [Response]
   #indicate whether you agree with the license and its default value is "no"
   AgreeToLicense=yes
   #indicate using Qpid as the message queue
   UPGRADE_MQ_TYPE=0
   ```

   RabbitMQ Sample Response File

   ```
   [Response]
   #indicate whether you agree with the license and its default value is "no"
   AgreeToLicense=yes
   #indicate using RabbitMQ as the message queue
   UPGRADE_MQ_TYPE=1
   # The RabbitMQ userid
   UPGRADE_MQ_UNAME=rabbitclient
   # The RabbitMQ password
   UPGRADE_MQ_PASSWORD=openstack1
   ```

   Notes:

   a. The property ;`AgreeToLicense` in the response file specifies your agreement to the license for the application. Its default value is set to `no`. You must specify `yes` to run the silent installation successfully.

b. The UPGRADE_MQ_TYPE property specifies the message queue type. Its default value is set to 1, which means you use RabbitMQ as the message queue. If the value is set to 0, it means you use Qpid as the message queue.

c. The UGRADE_MQ_UNAME and UPGRADE_MQ_PASSWORD properties specify the RabbitMQ user ID and password. If you use Qpid as the message queue type, you do not need to set the UPGRADE_MQ_UNAME and UPGRADE_MQ_PASSWORD properties.

Note:

3. Next, open a command prompt and input the following statement:

Note: The following statement must be entered on a single line, even though the example shows a line break for formatting purposes.

```
msiexec /i "IBM Cloud Manager with OpenStack Hyper-V Agent.msi"
/qn USEINI="absolute path to responsefile"
```

The following properties in the nova.conf file are copied:

```
glance_host;
glance_port;
qpid_hostname;
qpid_port;
qpid_username;
qpid_password;
instances_path;
neutron_url;
neutron_admin_username;
neutron_admin_password;
neutron_admin_tenant_name;
neutron_region_name;
neutron_admin_auth_url;
auth_strategy with default value "keystone";
flat_injected with default value "true";
rpc_thread_pool_size with default value "128";
rpc_conn_pool_size with default value "60";
rpc_response_timeout with default value "600";
use_cow_images=" ";
vswitch_name=" ";
use_ipv6 with default value "true";
verbose with default value "false";
log_dir=" ";
```

These following properties in neutron.conf file are copied:

```
qpid_hostname;
qpid_port;
qpid_username;
qpid_password;
allow_overlapping_ips;
rpc_thread_pool_size with default value "128";
rpc_conn_pool_size with default value "60";
rpc_response_timeout with default value "600";
```

The following properties in hyperv_neutron_agent.ini file are copied:

```
qpid_hostname;
qpid_username;
qpid_password;
physical_network_vswitch_mappings;
rpc_backend;
verbose;
debug;
control_exchange;
tenant_network_type;
network_vlan_ranges;
```

Notes:

a. If you manually modified properties that are not shown, you must manually modify those properties after the upgrade is complete.

b. If you use RabbitMQ as the message queue, the Qpid properties are replaced with RabbitMQ properties, including `rabbit_userid`, `rabbit_password`, `rabbit_host`, `rabbit_port`, and `rabbit_use_ssl`.

Chapter 5. Deploying an IBM Cloud Manager with OpenStack cloud

After IBM Cloud Manager with OpenStack is installed, you must follow these instructions to complete the installation.

To continue, select a topology and deploy the components that are necessary to create your cloud environment.

1. Select the topology that you want to deploy. Review the "Topology overview" for more information.
2. Deploy the components that are necessary to create your cloud environment. See "Deploying the cloud environment" on page 74 and follow the steps for the topology you select to deploy.

Topology overview

The IBM Cloud Manager with OpenStack solution provides some predefined topologies.

The following topologies are the supported configurations for IBM Cloud Manager with OpenStack.

Table 25. Supported topologies

Topology	Description
Minimal	For product evaluation purposes. This topology is the simplest topology and does not require any customization. Some basic customization is supported for the KVM/QEMU compute hypervisor type.
Controller +*n* compute	For smaller test or production environments. This topology provides a single controller node, plus any number of compute nodes. You can configure this topology for your specific needs. For example, configure networking, resource scheduler, and other advanced customization.
Distributed database	For larger test or production environments. This topology is similar to the controller +*n* compute topology; however, it allows the IBM Cloud Manager with OpenStack database service to run on a separate node. It also supports advanced customization.
Stand-alone self-service portal	For the environment in which you manage only VMware clouds. This topology provides a self-service portal node that is ONLY used to manage VMware clouds. OpenStack components are not installed.

The following terminology is used by the topologies:

Deployment server
The deployment server is the system where you install the IBM Cloud Manager with OpenStack product. The deployment server runs the Chef server and maintains the IBM Cloud Manager with OpenStack repository.

IBM Cloud Manager with OpenStack repository
The repository is the location that where all of the IBM Cloud Manager with OpenStack components are stored. The repository includes Chef resources, RPMs, commands, licenses, dependencies, and more. As an administrator, you manage your topology by using this repository.

Node A node is a system that is part of your topology. The applicable IBM Cloud Manager with OpenStack components are deployed to the node based on your cloud environment.

The repository, along with the associated OpenStack Chef cookbooks and dependencies provide the basic building blocks that you can use to deploy IBM Cloud Manager with OpenStack.

The topologies support the following operating systems, database, message queue, and OpenStack components.

Note: The following support information applies to the minimal, controller +n compute, and distributed database topologies only. The stand-alone self-service portal topology includes only the self-service portal.

- OpenStack Components: Identity, Image, Network, Compute, Orchestration, Block Storage, Telemetry, and Dashboard
- OpenStack Networking: Neutron
- OpenStack Compute Scheduler: Compute scheduler filters, IBM Platform Resource Scheduler (PRS)
- Operating System for OpenStack controller: Red Hat Enterprise Linux 6.5 or z/VM 6.3
- Database: IBM DB2 (default) , MySQL
- Message Queue: RabbitMQ (default), Qpid
- Hypervisor types: Linux Kernel-based Virtual Machine (KVM), PowerKVM, QEMU, z/VM, and Hyper-V
- Virtualization Manager: PowerVC
- Self-service portal

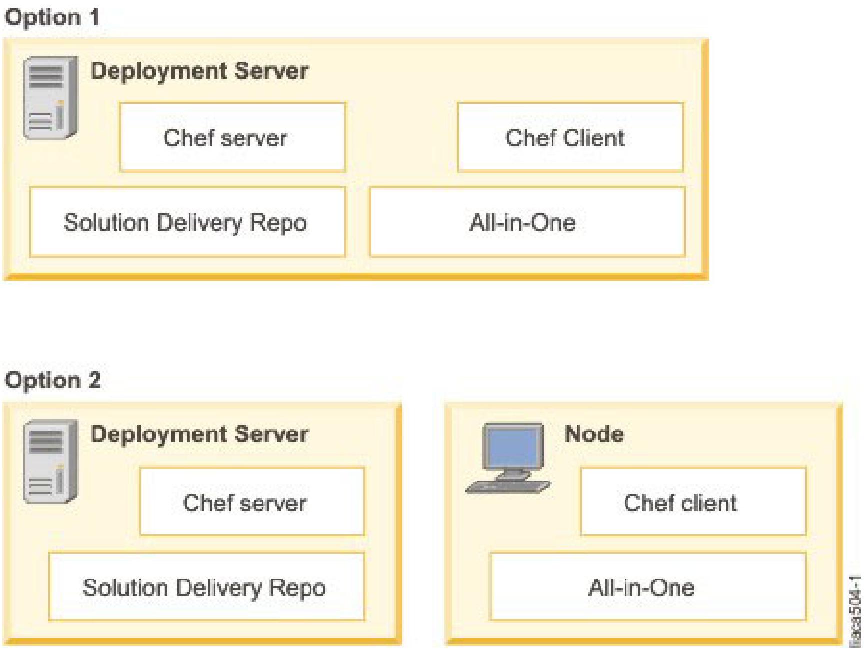
You can use a single IBM Cloud Manager with OpenStack setup to manage multiple topologies and multiple environments for those topologies. To manage, use the IBM Cloud Manager with OpenStack commands that simplify administration.

Minimal deployment

This topology is for product evaluation or proof of concept deployments.

With the minimal topology, all IBM Cloud Manager with OpenStack services run from one system. The IBM Cloud Manager with OpenStack node runs basic services, including the KVM/QEMU Nova compute service.

The deployment server is the system to which you install IBM Cloud Manager with OpenStack. The solution delivery repository is the repository that contains all the IBM Cloud Manager with OpenStack components. As an administrator, you manage the topology using this repository. The graphic below shows some examples of deploying a minimal topology. Option 2 is the recommended example if you plan to use the deployment server to deploy additional cloud topologies.



Controller +*n* compute deployment

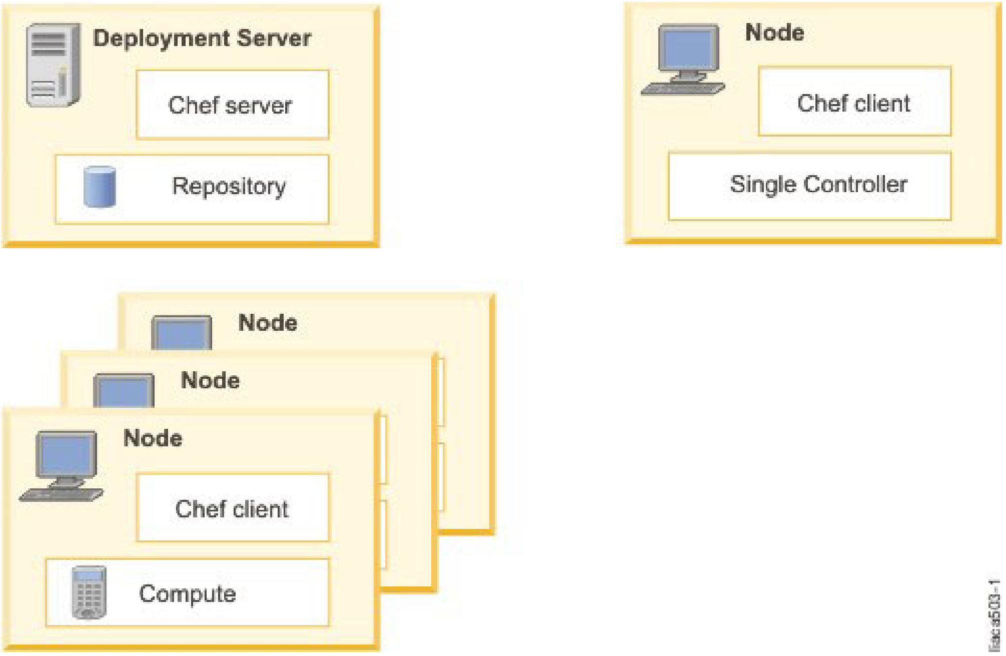
This topology is for smaller deployments.

The controller +*n* compute deployment topology is similar in size to the topology used by IBM SmartCloud Entry 3.1 and 3.2. The IBM Cloud Manager with OpenStack single controller node provides the basic IBM OpenStack services, excluding the OpenStack compute node services. The OpenStack compute node services are provided by the IBM Cloud Manager with OpenStack compute nodes. The IBM Cloud Manager with OpenStack single controller node can run PowerVC driver services. This topology supports all of the IBM Cloud Manager with OpenStack supported compute hypervisors. The specific compute hypervisors supported include:

- KVM/QEMU
- PowerKVM
- z/VM
- Hyper-V

Note: The Chef client does not run on Hyper-V compute nodes since the Hyper-V Agent installer is used.

Deploying this topology requires a minimum of two systems. One system is for the deployment server and the other system is for the IBM Cloud Manager with OpenStack single controller node. If the KVM/QEMU, PowerKVM, Hyper-V, or z/VM compute hypervisor is used, then one or more systems are also required to provide the IBM Cloud Manager with OpenStack compute nodes for the topology. Deploying a topology to manage to PowerVC requires an existing IBM Power Virtualization Center to be available.



Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Distributed database deployment

This topology is for larger deployments that use a distributed database.

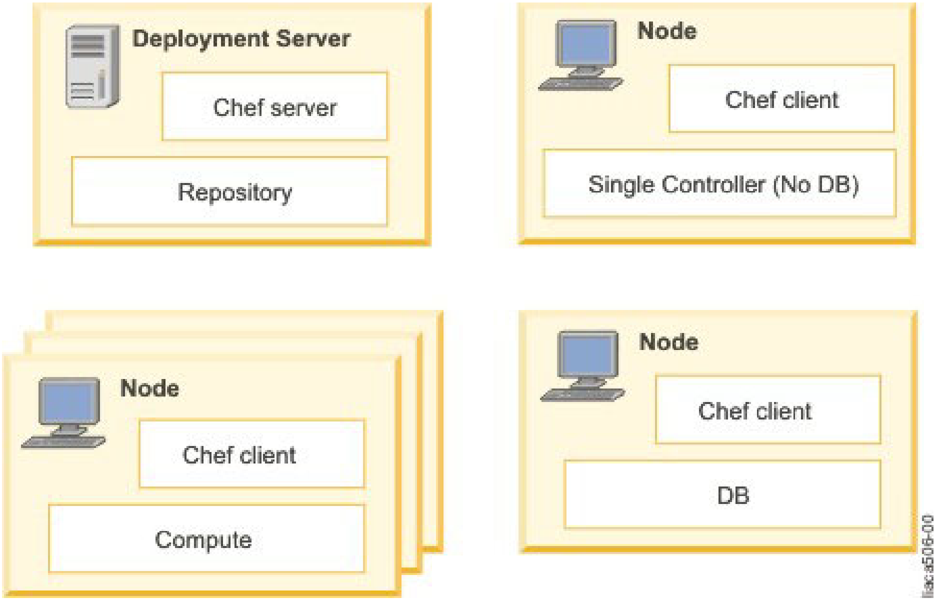
The distributed database deployment topology is similar to the controller +*n* compute topology; however, it allows the IBM Cloud Manager with OpenStack database service to run on a separate node. The IBM Cloud Manager with OpenStack single controller node provides the basic IBM OpenStack services, excluding the OpenStack compute node services. The OpenStack compute node services are provided by the IBM Cloud Manager with OpenStack compute nodes. The IBM Cloud Manager with OpenStack single controller node can run PowerVC driver services. This topology supports all of the IBM Cloud Manager with OpenStack supported compute hypervisors. The specific compute hypervisors supported include:

- KVM/QEMU hypervisor
- PowerKVM
- z/VM
- Hyper-V

Deploying this topology requires a minimum of three systems. One system is for the deployment server, another system is for the IBM Cloud Manager with OpenStack database service, and the third system is for the IBM Cloud Manager with OpenStack single controller node. If the KVM/QEMU, PowerKVM, Hyper-V, or z/VM compute hypervisor is used, then one or more systems are also required to provide the IBM Cloud Manager with OpenStack compute nodes for the topology. Deploying a topology to manage to PowerVC requires an existing IBM Power Virtualization Center to be available.

This image shows the IBM Cloud Manager with OpenStack database service running on a separate node.

Note: The Chef client does not run on Hyper-V compute nodes since the Hyper-V Agent installer is used.

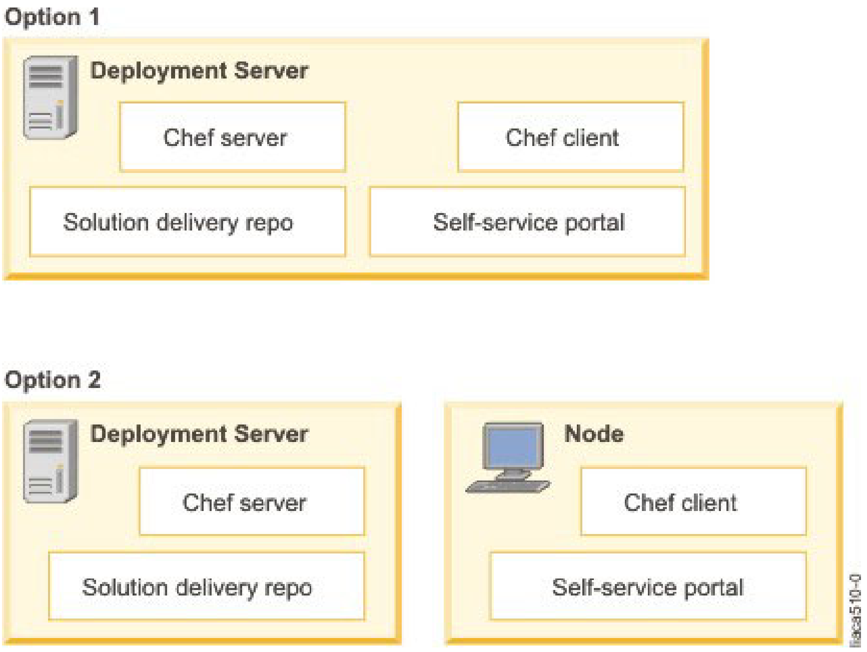


Stand-alone self-service portal deployment

This topology is for VMware cloud management.

With the stand-alone self-service portal topology, only the self-service portal service is installed on the node. OpenStack components are not installed.

The deployment server is the system on which you install IBM Cloud Manager with OpenStack. The solution delivery repository is the repository that contains all of the IBM Cloud Manager with OpenStack components. As an administrator, you manage the topology by using this repository. The following image shows some examples of deploying a stand-alone self-service portal deployment topology. Use the example in Option 2 if you plan to use the deployment server to deploy additional cloud topologies.



Deploying the cloud environment

Deploy the components that are necessary to create your cloud environment.

Complete the prerequisites, then follow the steps for the topology you want to deploy.

Deploying prerequisites

Before deploying an IBM Cloud Manager with OpenStack topology, you need to complete the prerequisites.

Procedure

1. Install the latest fix packs for IBM Cloud Manager with OpenStack before you proceed. For information about fix packs, see "Applying fixes and updates" on page 39.
2. Identify the node systems for the topology. Validate and collect basic information about a node system. Change **node-fqdn** to the fully qualified domain name of a node system. The deployment system must be able to **SSH** by using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name. You are prompted for the SSH root user password for the node. To use an SSH identity file instead of a password, use the **-i node-ssh-identity** option, where *node-ssh-identity* is the SSH identity file for the node.

   ```
   knife os manage validate node node-fqdn
   ```

   The command performs basic validation on the node system and displays the results to the terminal. The command also stores the results in a JSON file, `validate_node_node-fqdn.json`, and creates a cloud configuration YAML snippet file, `node_node-fqdn.yml`, in the current directory. The YAML snippet file contains network information collected for the node, including the recommended management network to use for the node. The file does not contain a recommended data network for the node, even if a data network exists. In addition, the file may not identify networks that have unique configurations. The node's network information is used when you deploy your cloud environment.

   a. Verify that the time on the node systems is within 15 minutes of the time that is shown on the deployment server. Consider synchronizing the system clock of the deployment server and node systems with a network time protocol (NTP) server. For more information, see "Installing a network time service" on page 161.

      Note: You can configure the deployment server as the network time protocol (NTP) server. When you are following the deployment process, customize the topology to use the NTP server you configured. Look for the customization step.

   b. Record the IP addresses for each node.

   c. Record the fully qualified domain names for each node.

   d. Record the root user login information (either password or SSH identity file) for each node.

   e. Record the number and name of each network interface card on each node.

      - Management network = Defaults to *eth0*. It is used for OpenStack communication between nodes.
      - Virtual machine data network = Defaults to *eth1* (optional). It is used for virtual machine data communication within the cloud environment and is only required if you are using VLAN or Flat networks. Do not use a management or external network as the virtual machine data network.
      - External network L3 network = Defaults to *eth0*. It can be shared with the management network, which is the default configuration.

      If the deployment nodes do not have an *eth0* or *eth1* interface or if the management, external network and virtual machine data network are on different interfaces besides *eth0* and *eth1*, then you must change the default environment settings when you configure the deployment.

Note:

- The network interface cards must not connect to the same network at the same time. For example, *eth0* and *eth1* must not connect to `Network A` at the same time.
- The example environment assumes that the network configuration is identical across all of the deployment nodes.

f. The network configuration and hypervisor type limit the type of networks that can be defined. For more information about network considerations, see “Network considerations” on page 16.

3. Verify the OpenStack controller node system meets the following criteria:
   - Operating System: Red Hat Enterprise Linux 6.5 or z/VM 6.3
   - Architecture: *x86_64*, *ppc64*, or *64-bit IBM z/Architecture*
4. If applicable, verify that the PowerVC environment that you want to manage meets the “IBM Power Virtualization Center prerequisites” on page 12.
5. If applicable, verify the KVM, QEMU compute node system meets the following criteria:
   - See “KVM or QEMU prerequisites” on page 11 for details.
   - To use the KVM hypervisor type on a node system, the node must support KVM acceleration. If the node system does not support KVM acceleration, then you must use the QEMU hypervisor type. To use the QEMU hypervisor type, set the **`openstack.compute.libvirt.virt_type`** attribute to *qemu* in the *default_attributes* section of your environment when you deploy your cloud environment. The Minimal topology uses the QEMU hypervisor type by default. Note that the QEMU hypervisor type is not recommended for a production deployment. For details , see the OpenStack documentation.
6. If applicable, verify that the z/VM compute node system meets the following criteria:
   - See “z/VM prerequisites” on page 14 for details.
   - To use the z/VM hypervisor, one or more x86_64 Red Hat Enterprise Linux system nodes should be used to install the compute and network driver to manage the z/VM hypervisor. One x86_64 Red Hat Enterprise Linux system node is supported for each z/VM node. For more information on configuring the z/VM hypervisor, see the Enabling z/VM for OpenStack user manual.
7. If applicable, verify the PowerKVM compute node system meets the following criteria: See “PowerKVM prerequisites” on page 12 for details.
8. If applicable, verify that the Hyper-V compute node system meets the following criteria: See “Installing and uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent” on page 28 for details.
9. Linux node systems must have access to a yum repository, which contains base operating system packages for your node systems. Many of the OpenStack components depend on operating system packages that are automatically installed on the node system during the deployment process. To determine if a node has access to a yum repository you can run the **`yum list libvirt`** command on the node. If the command fails, a valid yum repository does not exist on the node. If you do not have a yum repository configured on the node system, you can configure the Deployment Server to create the yum repositories on the nodes automatically when OpenStack is deployed. For configuration information, see “Configuring operating system yum repositories on the deployment server” on page 37.
10. Consider this restriction before deploying IBM Cloud Manager with OpenStack, in case you must undo a deployment.
    - Support does not exist to uninstall a deployed topology for IBM Cloud Manager with OpenStack. You must reinstall or reset the node back to its pre-deployment state. You cannot attempt to redeploy to the same managed system without first setting the node back to its pre-deployment state. Back up your node system before deployment by using existing snapshot or capture capabilities that are provided by the underlying virtualization manager or other backup methods.
    - The node must also be deleted from the chef server. For more information, see “Redeploying a node cleanup” on page 148.

11. To ensure the IP address moves from the interface to the corresponding OVS bridge, verify that the following preconditions are met.
    a. Each interface must have an `ifcfg-ethX` file in the `/etc/sysconfig/network-scripts/` directory.
    b. If **`BOOTPROTO`** is static, the **`IPADDR`**, **`DEVICE`** attributes must be contained in the `ifcfg-ethX` file. In addition, either **`PREFIX`** or **`NETMASK`** must be specified in the `ifcfg-ethX` file as well.
    c. Before you deploy, the controller node and compute node have a default gateway.
12. If the controller node has several CPUs, deploying the topology might fail because of excessive database connections. The following troubleshooting topics, that are related to deploying topologies, can help you to identify and correct this problem, if relevant for your environment:
    - “DB2 database requests fail with SQL1225N” on page 301
    - “MySQL database requests fail with "Too many connections"” on page 302

    A correct configuration for this problem depends on several factors, including the database engine, number of CPUs, physical memory, and swap space.
13. Consider whether to encrypt passwords during the deployment process. When you enter passwords into files during the deployment process (such as in the cloud YAML, passwords JSON, or topology JSON files), you can use a command to encrypt the password. The encryption avoids having clear text passwords in those files.

    ```
    knife os manage encrypt password [PASSWORD]
    ```

    The command takes a clear text password and returns an encrypted password that can be used by the other IBM Cloud Manager with OpenStack commands when processing a deployment.

Deploying an evaluation cloud

Use the following procedure to deploy the components necessary to create a very basic cloud environment. The cloud environment is for product evaluation or a proof of concept and uses the minimal topology with KVM or QEMU compute nodes.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Deploy your topology. Change **`node.fqdn.com`** to the fully qualified domain name of the node.

    ```
    $ knife os manage deploy evaluation node.fqdn.com
    ```

    Note: With the evaluation deployment, you must have separate nodes for the deployment system and the node. If that is not possible, then you must deploy using the minimal topology and customize the topology to use the Qpid message service. See “Deploying a prescribed configuration with KVM or QEMU compute nodes” on page 79 for instructions.
3. After the deployment completes, the IBM Cloud Manager with OpenStack services are ready to use.

    The IBM Cloud Manager with OpenStack dashboard is available at https://node.fqdn.com/, where **`node.fqdn.com`** is the fully qualified domain name of the node. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://node.fqdn.com:18443/cloud/web/login.html`. You can log in using *admin* user with *admin* as the default password.

    For information about managing IBM Cloud Manager with OpenStack services, see “Managing IBM Cloud Manager with OpenStack services” on page 207.

    Additionally, the IBM Platform Resource Scheduler (PRS) is enabled as the default OpenStack scheduling engine, for more information see “Customizing the scheduler” on page 110.

Results

You are ready to start using your cloud environment. To continue, see “Using your cloud environment” on page 144.

Related reference:

"Messaging service limitation when deployment server and IBM Cloud Manager with OpenStack controller are on same server" on page 331
You must use the Qpid messaging service if your deployment server and the IBM Cloud Manager with OpenStack controller are on the same server.

Deploying a test or production cloud

Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Related concepts:

"Controller +*n* compute deployment" on page 71
This topology is for smaller deployments.

Deploying with Hyper-V compute nodes

Deploy the components that are necessary to create a cloud environment with Hyper-V compute nodes.

Before you begin

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

About this task

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the *root* user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **your-deployment-name** to the name for your deployment.

   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the example environment for the topology that you deploy. Change **your-environment-name** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```
4. Change the following JSON attributes in your environment file, `your-environment-name.json`:
   a. **Name**: Set to your environment name: your-environment-name.
   b. **Description**: Set to the description for your environment.
   c. **openstack.region**: (Optional) Customize the region name for your cloud. The region name must not contain spaces or special characters.
   d. **openstack.endpoints.host, openstack.endpoints.bind-host, and openstack.endpoints.mq.host**: Change from *127.0.0.1* to the IP address of the controller node system for the topology.
   e. **openstack.network.ml2.mechanism_drivers**: *hyperv*
   f. **openstack.network.ml2.tenant_network_types**: *vlan* or *flat*, depending on your environment. The default value is *vlan*.
   g. **openstack.network.ml2.flat_networks**: Add your Hyper-V flat networks. For example, *physnet1*.
   h. **openstack.network.ml2.network_vlan_ranges**: Add your Hyper-V network VLAN range. For example, *physnet1:1000:2999*.

Network configuration: If the management network interface of your single controller node is not *eth0*, if the virtual machine data network interface is not *eth1*, or if both apply, then update all occurrences of *eth0*, *eth1*, or both in the environment file to match your network configuration.

5. Copy the following example topology to a file, `your-topology-name.json`. Change **`your-topology-name`** to the name for your topology. Here is an example topology with Hyper-V compute nodes.

   ```
   {
     "name":"CHANGEME",
     "description":"CHANGEME",
     "environment":"CHANGEME",
     "secret_file":"CHANGEME",
     "run_sequentially":false,
     "nodes": [
       {
         "fqdn":"CHANGEME",
         "password":"CHANGEME",
         "identity_file":"CHANGEME",
         "quit_on_error":true,
         "run_order_number":1,
          "runlist": [
           "role[ibm-os-single-controller-node]",
           "role[ibm-os-prs-ego-master]",
           "role[ibm-os-prs-controller-node]",
           "role[ibm-sce-node]"
        ]
       }
     ]
   }
   ```

6. Customize the topology file. The node in your topology file is your single controller node. The Hyper-V compute nodes will be deployed after the single controller node. Change the following JSON attributes in your topology file, `your-topology-name.json`:
   a. **`Name`**: Set to your topology name: *your-topology-name*.
   b. **`Description`**: Set to the description for your topology.
   c. **`Environment`**: Set to the environment for your topology: *your-environment-name*.
   d. **`nodes.fqdn`**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
   e. **`nodes.password`** or **`nodes.identity_file`**: Set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute.
7. Customize the passwords and secrets before deploying. For instructions, see “Customizing passwords and secrets” on page 114.
8. Configure the OpenStack block storage (cinder) driver. By default, the environment is configured to use the LVM iSCSI cinder driver. You can change the following JSON attributes in your environment file, `your-environment-name.json`, to customize the LVM iSCSI cinder driver configuration.
   a. **`openstack.block-storage.volume.create_volume_group`**: If set to *true*, then the cinder-volumes volume group is created on the controller node with a size determined by **`openstack.block-storage.volume.volume_group_size`**. If set to *false* (default), then you can create the volume group manually using physical disks. For more information, see “Creating an LVM volume group using physical disks” on page 132.
   b. **`openstack.block-storage.volume.volume_group_size`**: The amount of storage you use must be smaller than the size available. If necessary, you can set the value to your free disk size. The default value is 40 GB. This attribute is used only if **`openstack.block-storage.volume.create_volume_group`** is set to true.
   c. **`openstack.block-storage.volume.iscsi_ip_address`**: Change from *127.0.0.1* to the management IP address of the controller node.

To customize your environment for the IBM Storwize Cinder driver, see“Configuring IBM Storwize Cinder driver” on page 132.

9. (Optional) Complete any optional customizations. For options, see “Deployment customization options” on page 109.

   Note: Some customization options might not be supported for all hypervisor types and some cannot be configured after you deploy your cloud environment.

10. Deploy your topology.
    a. Upload the environment for your deployment.
    ```
    $ knife environment from file your-environment-name.json
    ```
    b. Deploy the topology.
    ```
    $ knife os manage deploy topology your-topology-name.json
    ```
    c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.
    ```
    $ knife os manage services status –-topology-file your-topology-name.json
    ```
11. Install the Hyper-V agent on your Hyper-V compute nodes. For instructions, see “Installing and uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent” on page 28.
12. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://controller.fqdn.com/`, where **`controller.fqdn.com`** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://controller.fqdn.com:18443/cloud/web/login.html`. You can log into either using *admin* user with the password that you customized in step 7 on page 78.

    For more information about managing IBM Cloud Manager with OpenStack services, see “Managing IBM Cloud Manager with OpenStack services” on page 207.

Results

You are ready to start using your cloud environment. To continue, see “Using your cloud environment” on page 144.

Related reference:

“Troubleshooting errors when deploying or updating topologies” on page 301
If a topology deployment or update fails, review the log output from the deployment command for more information.

Deploying with KVM or QEMU compute nodes

Deploy the components that are necessary to create a cloud environment with KVM or QEMU compute nodes. You can complete the deployment with either a prescribed or advanced configuration.

Deploying a prescribed configuration with KVM or QEMU compute nodes:

Deploy the components that are necessary to create a cloud environment with KVM or QEMU compute nodes by using a prescribed cloud configuration.

Before you begin

Before you begin, ensure you completed the “Deploying prerequisites” on page 74 steps.

About this task

The following information provides details about this prescribed configuration.

Table 26. Summary of prescribed configuration

Component	Configuration
OpenStack Components	Identity, Image, Network, Compute, Orchestration, Block Storage, Telemetry, and Dashboard
OpenStack Networking	Neutron with ML2 plugin using Open vSwitch mechanism driver
OpenStack Network Types Supported	• Minimal topology: Local • All topologies except Minimal: – Local, GRE – Flat, VLAN or VXLAN (Note: Only supported if the controller node has a data network.) **Note:** You must create your initial OpenStack networks after deployment. For more information, see "Creating initial networks" on page 155.
OpenStack compute scheduler	IBM Platform Resource Scheduler (default) or Compute scheduler filters
OpenStack Block Storage Driver	LVM iSCSI Cinder driver **Note:** For the Minimal topology, an initial 40 GB volume group is created that uses a file-backed loop device. For other topologies, you must create an LVM volume group using physical disks after deployment. For more information, see "Creating an LVM volume group using physical disks" on page 132.
Database	IBM DB2 (default) or MySQL
Message Queue	RabbitMQ (default) or Qpid
Hypervisor Type	• Minimal topology: QEMU • All topologies except Minimal: KVM
Self-service portal	Enabled (default) or disabled

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.
   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the appropriate example cloud file as the base structure for your cloud deployment and rename it for your cloud environment.
   a. Identify the topology, and its associated example cloud file, that you want to deploy for your cloud.
      - `Minimal`: *example-minimal-cloud.yml*
      - `Controller +n compute`: *example-controller-n-compute-kvm-cloud.yml*
      - `Distributed database`: *example-distributed-database-kvm-cloud.yml*

      For more information about each topology type, see "Topology overview" on page 69.
   b. Run the following command to copy the example cloud file that you want to use and rename it for your cloud.

Note: This step assumes the default IBM Cloud Manager with OpenStack installation path on the deployment server (`/opt/ibm/cmwo`).

In the following command, change *example-cloud*.yml to the example cloud file for the topology that you want to deploy. Change *your-cloud*.yml to the name of your cloud.

```
$ cp /opt/ibm/cmwo/cli/config/example-cloud.yml your-cloud.yml
```

4. Change the required YAML attributes in your cloud file, *your-cloud*.yml.
   - **Cloud Information (cloud)**: Customize the cloud information.
     a. **`name`**: Set the name for your cloud. The name cannot contain spaces or special characters. This name is also used as the OpenStack region name.
     b. **`password`**: Set the cloud administrator (*admin*) user's password. This value is not required or supported for the minimal topology. The minimal topology defaults the password to *admin*.
   - **Node Information (nodes)**: Customize the information for each node system in your cloud. For the `controller +n compute` or `distributed database` topologies, you can copy the *kvm_compute* node section to include more KVM compute nodes in your cloud.
     a. **`name`** and **`description`**: Leave these set to the default values provided.
     b. **`fqdn`**: Set to the fully qualified domain name of the node system. The deployment system must be able to **`SSH`** by using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
     c. **`password`** or **`identity_file`**: Set to the appropriate SSH root user authentication for the node system. You can use either a password or an SSH identity file for authentication.
     d. **`nics.management_network`**: Set to the management network interface card for the node system. This network is used for IBM Cloud Manager with OpenStack communication between the nodes in the cloud. The **`fqdn`** setting for the node must resolve to the IP address of this network. The default is *eth0*.
     e. **`nics.data_network`**: Set to the data network interface card for the node system. The default is *eth1*. If the node system does not have a second network interface card that can be used as a data network, then set to ~. Do not set to the same value as **`nics.management_network`**. Also, do not set to a network interface card that provides an alternative management network or an external network for the node, for example, a private or public IP address. A data network is required to use VLAN or Flat networks in your cloud.
5. Optional: Complete any optional customization by changing the appropriate YAML attributes in your cloud file, *your-cloud*.yml.
   a. Optional: **Cloud Information (cloud)**: Customize the cloud information.
      - **`database_service_type`**: You can change the database that is used by OpenStack from DB2 (default) to MySQL by setting this attribute to *mysql*.
      - **`messaging_service_type`**: You can change the messaging queue that is used by OpenStack from RabbitMQ (default) to Qpid by setting this attribute to *qpid*.
      - **`self_service_portal`** and **`self_service_portal_node_name`**: IBM Cloud Manager with OpenStack features an easy to use self-service portal for cloud operations. You can disable the self-service portal cloud feature by setting the **`self_service_portal`** attribute to *disabled* and the **`self_service_portal_node_name`** attribute to ~.
      - **`platform_resource_scheduler`**: IBM Cloud Manager with OpenStack features an enhanced OpenStack compute scheduler, IBM Platform Resource Scheduler. You can disable Platform Resource Scheduler and use the default OpenStack compute scheduler filters by setting this attribute to *disabled*. For more information about Platform Resource Scheduler, see Platform Resource Scheduler product information.

      Note: If you are using the deployment server as one of the nodes in your cloud (not recommended), then you must use the Qpid messaging service type.
   b. Optional: **Environment Information (environment)**: Customize the environment information.

- **`ntp.servers`**: Set to the NTP servers that are accessible to your deployment. The list of NTP servers must be comma separated, for example, [*your.0.ntpserver.com*, *your.1.ntpserver.com*]. The default is [*0.pool.ntp.org*, *1.pool.ntp.org*, *2.pool.ntp.org*, *3.pool.ntp.org*].

6. Deploy your cloud.

   ```
   $ knife os manage deploy cloud your-cloud.yml
   ```

   Note: This command generates a topology file and other related files for your deployment and stores them in the same directory as your cloud file, *your-cloud*.yml. The cloud file is no longer needed after the deployment completes and can be removed. The generated files are only used if you must update your cloud.

   ```
   $ rm your-cloud.yml
   ```

7. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://node.fqdn.com/`, where `node.fqdn.com` is the fully qualified domain name of the node. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://node.fqdn.com:18443/cloud/web/login.html`. You can log in to either using **`admin`** user with the password customized in step 4 on page 81.

   For more information about managing IBM Cloud Manager with OpenStack services, see “Managing IBM Cloud Manager with OpenStack services” on page 207.

Results

You are ready to start using your cloud environment. To continue, see “Using your cloud environment” on page 144.

Deploying an advanced configuration with KVM or QEMU compute nodes:

Deploy the components that are necessary to create a cloud environment with KVM or QEMU compute nodes using advanced configuration.

Before you begin

- Before you begin, ensure you completed the “Deploying prerequisites” on page 74 steps.
- For the node systems, the network configuration and hypervisor type limit the type of networks that can be defined. For example:

Table 27. Supported network configuration

Number of network interface cards (NICs) per node	Network type	Hypervisor type
1 - *eth0* is dedicated as the management network	• Local • GRE • VXLAN	KVM only **Note:** If one or more of the compute hypervisors is not KVM, then GRE and VXLAN cannot be used.
2 • *eth0* is the management network and the external network. • *eth1* is dedicated as the virtual machine data network. **Note:** Default configuration	• Local • Flat • VLAN • VXLAN • GRE	KVM only **Note:** If one or more of the compute hypervisors is not KVM, then GRE and VXLAN cannot be used.
3 or more • *eth0* is dedicated as the management network. • *eth1* is dedicated as the virtual machine data network. • *eth2* is dedicated as the external network. **Note:** Recommended configuration	• Local • Flat • VLAN • VXLAN • GRE	KVM only **Note:** If one or more of the compute hypervisors is not KVM, then GRE and VXLAN cannot be used.

Note:

– The virtual machine data network must be on a dedicated interface. Communication to the node must be done through the management network or another interface on the node.

- The `local` network type can be configured; however, the network traffic is limited to the current node. The minimum topology uses the `local` network option, by default.

For more information about network considerations, see “Network considerations” on page 16.

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.
   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the example environment for the topology that you deploy. Change **`your-environment-name`** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.
   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```
4. Change the following JSON attributes in your environment file, `your-environment-name.json`:
   - **`Name`**: Set to your environment name: *your-environment-name*.
   - **`Description`**: Set to the description for your environment.
   - **`openstack.region`**: (Optional) Customize the region name for your cloud. The region name must not contain spaces or special characters.
   - **`openstack.endpoints.host`**, **`openstack.endpoints.bind-host`**, and **`openstack.endpoints.mq.host`**: Change from *127.0.0.1* to the IP address of the controller node system for the topology.
   - **`openstack.compute.libvirt.virt_type`**: Set to the hypervisor type, *kvm or qemu*, for the topology.
   - **(Single network interface card or no virtual machine data network)**: If you are using a GRE or VXLAN network with a single network interface card on the nodes (or no virtual machine data network), you must change the following default values in the environment:
     ```
     openstack.network.openvswitch.tenant_network_type = "gre"
     openstack.network.openvswitch.bridge_mappings = ""
     openstack.network.openvswitch.network_vlan_ranges = ""
     openstack.network.openvswitch.bridge_mapping_interface = ""
     openstack.network.ml2.tenant_network_types = "gre"
     openstack.network.ml2.network_vlan_ranges = ""
     openstack.network.ml2.flat_networks = ""
     ```

     Note: If you are using VXLAN, then replace *gre* in the previous example with *vxlan*.

     If the management network interface of the nodes is not *eth0*, then update all occurrences of *eth0* in the environment file to match your network configuration on the nodes.

     (Recommended network configuration) If the management network interface of the nodes is not *eth0*, if the virtual machine data network interface is not *eth1*, or both apply, then update all occurrences of *eth0*, *eth1*, or both in the environment file to match your network configuration. The following list displays some of the networking properties and their default values (from the example environment) that you might need to change. In most cases, these default values should be sufficient and do not need to be changed.
     - **`openstack.network.core_plugin`**: *neutron.plugins.ml2.plugin.Ml2Plugin*.

       In the example environment, the **`openstack.network.core_plugin`** property is set to *"neutron.plugins.ml2.plugin.ML2Plugin"* and the **`openstack.network.ml2.mechanism_drivers`** property is set to *"openvswitch"*. The ML2 specific properties (properties that begin with

openstack.network.ml2.*) must be consistent and kept in sync with the properties of the mechanism driver (**openstack.network.openvswitch.***). The example environment is set up with these two sets of properties in sync.

- **openstack.network.openvswitch.bridge_mapping_interface**: *"br-eth1:eth1"*. The **bridge_mapping_interface** property is used to control the creation of the data network OVS bridge on the nodes. If Open vSwitch is installed and the data network bridge is already configured on the nodes, this property is not necessary and you can set the variable to " ". If a specific network configuration is needed for the data network (for example, bonding), you must set this variable to "" and complete set up manually before or after the node is converged.
- **openstack.network.openvswitch.bridge_mappings**: *"default:br-eth1"*. The **bridge_mappings** property controls which OVS bridge is used for flat and VLAN network traffic from the node. If this OVS bridge does not exist, the Open vSwitch agent does not start. This bridge can be automatically created by setting the **bridge_mapping_interface** property.
- **openstack.network.openvswitch.network_vlan_ranges** and **openstack.network.ml2.network_vlan_ranges**: These two properties define the default vlan range used when creating a tenant network. Both of these properties default to *default:1:4094*. This vlan range might need to be adjusted based on the vlan configuration of the physical switches and hypervisors in your environment. The values of both properties must be the same.

5. Copy the following example topology to a file, `your-topology-name.json`. Change **your-topology-name** to the name for your topology. Here is an example topology with KVM or QEMU compute nodes.

```
{
  "name":"CHANGEME",
  "description":"CHANGEME",
  "environment":"CHANGEME",
  "secret_file":"CHANGEME",
  "run_sequentially":false,
  "nodes": [
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":1,
       "runlist": [
         "role[ibm-os-single-controller-node]",
         "role[ibm-os-prs-ego-master]",
         "role[ibm-os-prs-controller-node]",
         "role[ibm-sce-node]"
      ]
              },
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":2,
      "runlist": [
        "role[ibm-os-compute-node-kvm]",
        "role[ibm-os-prs-compute-node]"
      ]
    }
  ]
}
```

6. Customize the topology file.
   a. The first node in your topology file is your single controller node. The second node in your topology file is for a compute node. If your topology requires extra compute nodes, copy the compute node section as many times as needed. Ensure that additional compute node sections are comma-separated.

b. Change the following JSON attributes in your topology file, `your-topology-name.json`:
   - **`Name`**: Set to your topology name: *your-topology-name*.
   - **`Description`**: Set to the description for your topology.
   - **`Environment`**: Set to the environment for your topology: *your-environment-name*.
   - **`nodes.fqdn`**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
   - **`nodes.password`** or **`nodes.identity_file`**: For each node, set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute for each node.

c. (Optional) Create node specific attribute files. This step is only required when one or more nodes in your topology require different attributes from those defined in your environment file `your-environment-name.json`.

   1) Create a node-specific attribute file that is similar to the following format. For example, a node may not have an *eth0* network interface, which is the default value for some attributes. Below is an example node attribute file that can be used to change the *eth0* default network on a compute node over to use *eth2*.

```
{
  "openstack": {
    "endpoints": {
      "network-openvswitch": {
        "bind_interface": "eth2"
      },
      "compute-vnc-bind": {
        "bind_interface": "eth2"
      }
    }
}
```

   After creating the node specific attribute files, add the **`nodes.attribute_file`** JSON attributes in your topology file, `your-topology-name.json`:
   - **`nodes.attribute_file`**: For each node, set to the attribute JSON file which overrides the attributes in the **`default_attributes`** section of the environment file.

7. Customize the passwords and secrets before deploying. For instructions, see “Customizing passwords and secrets” on page 114.

8. Configure the OpenStack block storage (cinder) driver. By default, the environment is configured to use the LVM iSCSI cinder driver. You can change the following JSON attributes in your environment file, `your-environment-name.json`, to customize the LVM iSCSI cinder driver configuration.

   a. **`openstack.block-storage.volume.create_volume_group`**: If set to *true*, then the cinder-volumes volume group is created on the controller node with a size determined by **`openstack.block-storage.volume.volume_group_size`**. If set to *false* (default), then you can create the volume group manually using physical disks. For more information, see “Creating an LVM volume group using physical disks” on page 132.

   b. **`openstack.block-storage.volume.volume_group_size`**: The amount of storage you use must be smaller than the size available. If necessary, you can set the value to your free disk size. The default value is 40 GB. This attribute is used only if **`openstack.block-storage.volume.create_volume_group`** is set to true.

   c. **`openstack.block-storage.volume.iscsi_ip_address`**: Change from *127.0.0.1* to the management IP address of the controller node.

   To customize your environment for a different cinder driver, see “Configuring Cinder drivers” on page 129.

9. (Optional) Complete any optional customizations. For options, see “Deployment customization options” on page 109.

Note: Some customization options might not be supported for all hypervisor types and some cannot be configured after you deploy your cloud environment.

10. Deploy your topology.
    a. Upload the environment for your deployment.
    ```
    $ knife environment from file your-environment-name.json
    ```
    b. Deploy the topology.
    ```
    $ knife os manage deploy topology your-topology-name.json
    ```
    c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.
    ```
    $ knife os manage services status –-topology-file your-topology-name.json
    ```
11. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://controller.fqdn.com/`, where **`controller.fqdn.com`** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://controller.fqdn.com:18443/cloud/web/login.html`. You can log into either using *admin* user with the password that you customized in step 7 on page 85.

    For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.
12. (Optional) Verify the Open vSwitch (OVS) configuration for your network. See "Verifying Open vSwitch configuration" on page 143.

What to do next

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Related reference:

"Troubleshooting errors when deploying or updating topologies" on page 301
If a topology deployment or update fails, review the log output from the deployment command for more information.

Platform Resource Scheduler online product documentation

Configure the Image Service

"Creating initial networks" on page 155
After you deploy the components for creating a cloud environment, you can create several different types of networks.

Deploying with PowerKVM compute nodes

Deploy the components that are necessary to create a cloud environment with PowerKVM compute nodes. You can complete the deployment with either a prescribed or advanced configuration.

Deploying a prescribed configuration with PowerKVM compute nodes:

Deploy the components that are necessary to create a cloud environment with PowerKVM compute nodes by using a prescribed cloud configuration.

Before you begin

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

About this task

The following information provides details about this prescribed configuration.

Table 28. Summary of prescribed configuration

Component	Configuration
OpenStack Components	Identity, Image, Network, Compute, Orchestration, Block Storage, Telemetry, and Dashboard
OpenStack Networking	Neutron with ML2 plugin using Open vSwitch mechanism driver
OpenStack Network Types Supported	• GRE (Note: Supported with PowerKVM 2.1.1 only) • Flat, VLAN (Note: Only supported if the controller node has a data network.) **Note:** You must create your initial OpenStack networks after deployment. For more information, see "Creating initial networks" on page 155.
OpenStack compute scheduler	IBM Platform Resource Scheduler (default) or Compute scheduler filters
OpenStack Block Storage Driver	LVM iSCSI Cinder driver **Note:** You must create an LVM volume group using physical disks after deployment. For more information, see "Creating an LVM volume group using physical disks" on page 132.
Database	IBM DB2® (default) or MySQL
Message Queue	RabbitMQ (default) or Qpid
Hypervisor Type	PowerKVM
Self-service portal	Enabled (default) or disabled

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.
```
$ mkdir your-deployment-name
$ chmod 600 your-deployment-name
$ cd your-deployment-name
```
3. Copy the appropriate example cloud file as the base structure for your cloud deployment and rename it for your cloud environment.
   a. Identify the topology, and its associated example cloud file, that you want to deploy for your cloud.
      - `Controller +n compute`: *example-controller-n-compute-powerkvm-cloud.yml*
      - `Distributed database`: *example-distributed-database-powerkvm-cloud.yml*

      For more information about each topology type, see "Topology overview" on page 69.
   b. Run the following command to copy the example cloud file that you want to use and rename it for your cloud.

      Note: This step assumes the default IBM Cloud Manager with OpenStack installation path on the deployment server (`/opt/ibm/cmwo`).

      In the following command, change *example-cloud*.yml to the example cloud file for the topology that you want to deploy. Change *your-cloud*.yml to the name of your cloud.
```
$ cp /opt/ibm/cmwo/cli/config/example-cloud.yml your-cloud.yml
```
4. Change the required YAML attributes in your cloud file, *your-cloud*.yml.

- **Cloud Information (cloud)**: Customize the cloud information.
  a. **name**: Set the name for your cloud. The name cannot contain spaces or special characters. This name is also used as the OpenStack region name.
  b. **password**: Set the cloud administrator (*admin*) user's password.
- **Node Information (nodes)**: Customize the information for each node system in your cloud. You can copy the *powerkvm_compute* node section to include more PowerKVM compute nodes in your cloud.
  a. **name** and **description**: Leave these set to the default values provided.
  b. **fqdn**: Set to the fully qualified domain name of the node system. The deployment system must be able to **SSH** by using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
  c. **password** or **identity_file**: Set to the appropriate SSH root user authentication for the node system. You can use either a password or an SSH identity file for authentication.
  d. **nics.management_network**: Set to the management network interface card for the node system. This network is used for IBM Cloud Manager with OpenStack communication between the nodes in the cloud. The **fqdn** setting for the node must resolve to the IP address of this network. The default is *eth0*.
  e. **nics.data_network**: Set to the data network interface card for the node system. The default is *eth1*. If the node system does not have a second network interface card that can be used as a data network, then set to ~. Do not set to the same value as **nics.management_network**. Also, do not set to a network interface card that provides an alternative management network or an external network for the node, for example, a private or public IP address. A data network is required to use VLAN or Flat networks in your cloud.

5. Optional: Complete any optional customization by changing the appropriate YAML attributes in your cloud file, *your-cloud*.yml.
   a. Optional: **Cloud Information (cloud)**: Customize the cloud information.
      - **database_service_type**: You can change the database that is used by OpenStack from DB2 (default) to MySQL by setting this attribute to *mysql*.
      - **messaging_service_type**: You can change the messaging queue that is used by OpenStack from RabbitMQ (default) to Qpid by setting this attribute to *qpid*.
      - **self_service_portal** and **self_service_portal_node_name**: IBM Cloud Manager with OpenStack features an easy to use self-service portal for cloud operations. You can disable the self-service portal cloud feature by setting the **self_service_portal** attribute to *disabled* and the **self_service_portal_node_name** attribute to ~.
      - **platform_resource_scheduler**: IBM Cloud Manager with OpenStack features an enhanced OpenStack compute scheduler, IBM Platform Resource Scheduler. You can disable Platform Resource Scheduler and use the default OpenStack compute scheduler filters by setting this attribute to *disabled*. For more information about Platform Resource Scheduler, see Platform Resource Scheduler product information.

   b. Optional: **Environment Information (environment)**: Customize the environment information.
      - **ntp.servers**: Set to the NTP servers that are accessible to your deployment. The list of NTP servers must be comma separated, for example, [*your.0.ntpserver.com*, *your.1.ntpserver.com*]. The default is [*0.pool.ntp.org*, *1.pool.ntp.org*, *2.pool.ntp.org*, *3.pool.ntp.org*].
6. Deploy your cloud.

   ```
   $ knife os manage deploy cloud your-cloud.yml
   ```

   Note: This command generates a topology file and other related files for your deployment and stores them in the same directory as your cloud file, *your-cloud*.yml. The cloud file is no longer needed after the deployment completes and can be removed. The generated files are only used if you must update your cloud.

   ```
   $ rm your-cloud.yml
   ```

7. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://node.fqdn.com/`, where `node.fqdn.com` is the fully qualified domain name of the node. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://node.fqdn.com:18443/cloud/web/login.html`. You can log in to either using **`admin`** user with the password customized in step 4 on page 87.

   For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

Results

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Deploying an advanced configuration with PowerKVM compute nodes:

Deploy the components that are necessary to create a cloud environment with IBM PowerKVM compute nodes using advanced configuration.

Before you begin

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

About this task

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.

   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the example environment for the topology that you deploy. Change **`your-environment-name`** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```
4. Change the following JSON attributes in your environment file, `your-environment-name.json`:
   - **`Name`**: Set to your environment name: *your-environment-name*.
   - **`Description`**: Set to the description for your environment.
   - **`openstack.region`**: (Optional) Customize the region name for your cloud. The region name must not contain spaces or special characters.
   - **`openstack.endpoints.host`**, **`openstack.endpoints.bind-host`**, and **`openstack.endpoints.mq.host`**: Change from *127.0.0.1* to the IP address of the controller node system for the topology.
   - **(Recommended network configuration)** If the management network interface of the nodes is not *eth0*, if the virtual machine data network interface is not *eth1*, or both apply, then update all occurrences of *eth0*, *eth1*, or both in the environment file to match your network configuration. The

following list displays some of the networking properties and their default values (from the example environment) that you might need to change. In most cases, these default values should be sufficient and do not need to be changed.

- **openstack.network.core_plugin**: *neutron.plugins.ml2.plugin.Ml2Plugin*.

  In the example environment, the **openstack.network.core_plugin** property is set to *"neutron.plugins.ml2.plugin.ML2Plugin"* and the **openstack.network.ml2.mechanism_drivers** property is set to *"openvswitch"*. The ML2 specific properties (properties that begin with **openstack.network.ml2.****) must be consistent and kept in sync with the properties of the mechanism driver (**openstack.network.openvswitch.****). The example environment is set up with these two sets of properties in sync.
- **openstack.network.openvswitch.bridge_mapping_interface**: *"br-eth1:eth1"*. The **bridge_mapping_interface** property is used to control the creation of the data network OVS bridge on the nodes. If Open vSwitch is installed and the data network bridge is already configured on the nodes, this property is not necessary and you can set the variable to " ". If a specific network configuration is needed for the data network (for example, bonding), you must set this variable to "" and complete set up manually before or after the node is converged.
- **openstack.network.openvswitch.bridge_mappings**: *"default:br-eth1"*.
  The **bridge_mappings** property controls which OVS bridge is used for flat and VLAN network traffic from the node. If this OVS bridge does not exist, the Open vSwitch agent does not start. This bridge can be automatically created by setting the **bridge_mapping_interface** property.
- **openstack.network.openvswitch.network_vlan_ranges** and **openstack.network.ml2.network_vlan_ranges**: These two properties define the default vlan range used when creating a tenant network. Both of these properties default to *default:1:4094*. This vlan range might need to be adjusted based on the vlan configuration of the physical switches and hypervisors in your environment. The values of both properties must be the same.

5. Copy the following example topology to a file, `your-topology-name.json`. Change **your-topology-name** to the name for your topology. Here is an example topology with PowerKVM compute nodes.

```
{
  "name":"CHANGEME",
  "description":"CHANGEME",
  "environment":"CHANGEME",
  "secret_file":"CHANGEME",
  "run_sequentially":false,
  "nodes": [
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":1,
       "runlist": [
         "role[ibm-os-single-controller-node]",
         "role[ibm-os-prs-ego-master]",
         "role[ibm-os-prs-controller-node]",
         "role[ibm-sce-node]"
     ]
    },
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":2,
      "runlist": [
        "role[ibm-os-compute-node-powerkvm]",
        "role[ibm-os-prs-compute-node]"
      ]
    }
  ]
}
```

6. Customize the topology file.
   a. The first node in your topology file is your single controller node. The second node in your topology file is for a compute node. If your topology requires extra compute nodes, copy the compute node section as many times as needed. Ensure that additional compute node sections are comma-separated.
   b. Change the following JSON attributes in your topology file, `your-topology-name.json`:
      - **`Name`**: Set to your topology name: *your-topology-name*.
      - **`Description`**: Set to the description for your topology.
      - **`Environment`**: Set to the environment for your topology: *your-environment-name*.
      - **`nodes.fqdn`**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
      - **`nodes.password`** or **`nodes.identity_file`**: For each node, set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute for each node.
   c. (Optional) Create node specific attribute files. This step is only required when one or more nodes in your topology require different attributes from those defined in your environment file `your-environment-name.json`.
      1) Create node specific attribute files. This step is only required when one or more nodes in your topology require different attributes from those defined in your environment file `your-environment-name.json`. For example, a node may not have an *eth0* network interface, which is the default value for some attributes. Below is an example node attribute file that can be used to change the *eth0* default network.

```
{
  "openstack": {
    "endpoints": {
      "network-openvswitch": {
        "bind_interface": "CHANGEME"  (Run the ifconfig command to identify
         the name of the interface, for example, enP3p9s0f0.)
      },
      "compute-vnc-bind": {
        "bind_interface": "CHANGEME"  (Run the ifconfig command to identify
         the name of the interface, for example, enP3p9s0f0.)
      }
    }
}
```

   After creating the node specific attribute files, add the **`nodes.attribute_file`** JSON attributes in your topology file, `your-topology-name.json`:
   - **`nodes.attribute_file`**: For each node, set to the attribute JSON file which overrides the attributes in the **`default_attributes`** section of the environment file.
7. Customize the passwords and secrets before deploying. For instructions, see "Customizing passwords and secrets" on page 114.
8. Configure the OpenStack block storage (cinder) driver. By default, the environment is configured to use the LVM iSCSI cinder driver. You can change the following JSON attributes in your environment file, `your-environment-name.json`, to customize the LVM iSCSI cinder driver configuration.
   a. **`openstack.block-storage.volume.create_volume_group`**: If set to *true*, then the cinder-volumes volume group is created on the controller node with a size determined by **`openstack.block-storage.volume.volume_group_size`**. If set to *false* (default), then you can create the volume group manually using physical disks. For more information, see "Creating an LVM volume group using physical disks" on page 132.

   b. **openstack.block-storage.volume.volume_group_size**: The amount of storage you use must be smaller than the size available. If necessary, you can set the value to your free disk size. The default value is 40 GB. This attribute is used only if **openstack.block-storage.volume.create_volume_group** is set to true.

   c. **openstack.block-storage.volume.iscsi_ip_address**: Change from *127.0.0.1* to the management IP address of the controller node.

   To customize your environment for a different cinder driver, see "Configuring Cinder drivers" on page 129.

9. (Optional) Complete any optional customizations. For options, see "Deployment customization options" on page 109.

   Note: Some customization options might not be supported for all hypervisor types and some cannot be configured after you deploy your cloud environment.

10. Deploy your topology.

    a. Upload the environment for your deployment.

    ```
    $ knife environment from file your-environment-name.json
    ```

    b. Deploy the topology.

    ```
    $ knife os manage deploy topology your-topology-name.json
    ```

    c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.

    ```
    $ knife os manage services status –-topology-file your-topology-name.json
    ```

11. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://controller.fqdn.com/`, where **controller.fqdn.com** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://controller.fqdn.com:18443/cloud/web/login.html`. You can log into either using *admin* user with the password that you customized in step 7 on page 91.

    For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

What to do next

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Related reference:

"Troubleshooting errors when deploying or updating topologies" on page 301
If a topology deployment or update fails, review the log output from the deployment command for more information.

Platform Resource Scheduler online product documentation

Deploying with z/VM compute nodes

Deploy the components that are necessary to create a cloud environment with z/VM compute nodes.

Before you begin

- Ensure you completed the "Deploying prerequisites" on page 74 steps.
- To use the z/VM hypervisor, one or more x86_64 Red Hat Enterprise Linux system nodes must be used to install the compute and network driver to manage the z/VM hypervisor. You can run several compute and network agent services (for several z/VM hypervisors) on one x86_64 Red Hat Enterprise Linux system node. For more information on configuring the z/VM hypervisor, see the z/VM OpenStack user manual.

About this task

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.

   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the example environment for the topology that you deploy. Change **`your-environment-name`** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```
4. Change the following JSON attributes in your environment file, `your-environment-name.json`:

   a.

   - **`Name`**: Set to your environment name: *your-environment-name*.
   - **`Description`**: Set to the description for your environment.
   - **`openstack.region`**: (Optional) Customize the region name for your cloud. The region name must not contain spaces or special characters.
   - **`openstack.endpoints.host`**, **`openstack.endpoints.bind-host`**, and **`openstack.endpoints.mq.host`**: Change from *127.0.0.1* to the IP address of the controller node system for the topology.
   - **`openstack.compute.instance_name_template`**: Change the default value to a string of 8 characters in length. For example, *abc%05x*.

     Note: z/VM does not support more than 8 characters; therefore, this parameter does not support more than 8 characters.

   b.

   - **(Recommended network configuration)** If the management network interface of the nodes is not *eth0*, if the virtual machine data network interface is not *eth1*, or both apply, then update all occurrences of *eth0*, *eth1*, or both in the environment file to match your network configuration.
   - Update the following attributes for the controller node in your environment file.
     - **`openstack.network.openvswitch.bridge_mapping_interface`**: Set the value as *nil*.
     - **`openstack.network.ml2.mechanism_drivers`**: Add *zvm*, using a comma-separated list.
     - **`openstack.network.ml2.flat_networks`**: Add your z/VM flat networks. You must include all flat networks of managed hosts, separated by a comma. For example, *xcatvsw1flat,xcatvsw2flat*.
     - **`openstack.network.ml2.network_vlan_ranges`**: Add your z/VM network VLAN range. You must include all VLAN networks of managed hosts, separated by a comma. For example, *xcatvsw1vlan:10:100,xcatvsw2vlan:10:100*.
     - **`ibm-openstack.network.l3.enable`**: Set the value to *false*. The `l3-agent` is not supported in z/VM.
     - **`ibm-openstack.network.ipmovement.enable`**: Set the value to *false*. The parameter is not required in z/VM.

c. z/VM compute nodes configurations: You can update the following attributes for the z/VM compute nodes in the environment file. Otherwise, you can specify the attributes in the attributes file for each node, as described in step 6 which describes how to customize the attribute file.

- **ibm-openstack.zvm-driver.hosts**: Specify all z/VM hypervisors to be managed.
- **ibm-openstack.zvm-driver.#host**: Specify each z/VM hypervisor managed, the value should match the values in **ibm-openstack.zvm-driver.hosts**. For example, if you set **ibm-openstack.zvm-driver.hosts** as *["server1","server2"]*, then you have the attributes *ibm-openstack.zvm-driver.server1* and *ibm-openstack.zvm-driver.server2*. This is also the top attribute for each managed z/VM hypervisor. The sub-attributes of each **ibm-openstack.zvm-driver.#host** describe properties of the corresponding z/VM hypervisor.
- **ibm-openstack.zvm-driver.#host.xcat.server**: Specify the xCAT MN IP address or host name.
- **ibm-openstack.zvm-driver.#host.xcat.username**: Specify the xCAT REST API user name.
- **ibm-openstack.zvm-driver.#host.xcat.zhcp_nodename**: Specify the zHCP node name in xCAT.
- **ibm-openstack.zvm-driver.#host.xcat.master**: Specify the xCAT master node (the node name in the xCAT definition).
- **ibm-openstack.zvm-driver.#host.xcat.mnadmin**: Specify the xCAT management user that can **ssh** into `xcat mn`. If you do not set this user, the default value is *mnadmin*.
- **ibm-openstack.zvm-driver.#host.xcat.mgt_ip**: Specify the first IP address of the management network.

  Note: Remember the xCAT management interface IP address. xCAT uses this IP address to connect a newly deployed instance server.
- **ibm-openstack.zvm-driver.#host.xcat.mgt_mask**: Specify the network mask of the xCAT management network. For example: *255.255.255.0*.
- **ibm-openstack.zvm-driver.#host.xcat.connection_timeout**: Specify the timeout value for reading the xCAT response in seconds.
- **ibm-openstack.zvm-driver.#host.xcat.image_clean_period**: Specify the amount of time that if the xCAT image is not used, it is purged after the specified time expires. The default is *30* days.
- **ibm-openstack.zvm-driver.#host.xcat.free_space_threshold**: Specify the threshold when xCAT MN disk space is not large enough. The default is *50G*. After the disk space threshold is met, a purge operation starts.
- **ibm-openstack.zvm-driver.#host.xcat.timeout**: Specify the number of seconds the agent waits for a xCAT MN response. The recommended value is *300*.
- **ibm-openstack.zvm-driver.#host.config.ram_allocation_ratio**: Specify the memory overcommit ratio for the z/VM Driver. The recommended value is *3*.
- **ibm-openstack.zvm-driver.#host.image.tmp_path**: Specify the path that images are stored (snapshot, deploy, and so on).
- **ibm-openstack.zvm-driver.#host.image.cache_manager_interval**: This value is not z/VM specific. Set it to the default *86400(s)*, which is 24 hours.
- **ibm-openstack.zvm-driver.#host.rpc_response_timeout**: Specify the timeout response time. The default is *180 seconds*. If the value is reached, the live migration does not succeed.
- **ibm-openstack.zvm-driver.#host.reachable_timeout**: After this value, the deployment reports an error '`Failed to power on instance`'.
- **ibm-openstack.zvm-driver.#host.polling_interval**: The Neutron z/VM agent's polling interval, in seconds.
- **ibm-openstack.zvm-driver.#host.config_drive.format**: The config driver format. This value must be *tgz*.

- **ibm-openstack.zvm-driver.#host.config_drive.inject_password**: Defines whether to inject the password in config drive. If it is set to *True*, the default `os root` password for the new booted virtual machine is the random value of the *adminPass* property that is shown in the output of the Nova boot command.
- **ibm-openstack.zvm-driver.#host.diskpool**: Specify the disk pool name from where xCAT allocates disks for new servers. The disk pool name is the name of the storage 'group' defined in the Directory Manager.
- **ibm-openstack.zvm-driver.#host.diskpool_type**: Specify the disk pool type, either FBA or ECKD™.
- **ibm-openstack.zvm-driver.#host.zvm_host**: Specify the xCAT node name of the z/VM hypervisor.
- **ibm-openstack.zvm-driver.#host.host**: Specify the host that is used to distinguish different Nova compute hosts. It can be the same as **zvm_host**.
- **ibm-openstack.zvm-driver.#host.user_profile**: Specify the default template of the user directory for new servers. Do not use *lnxdflt* but define your own profile.
- **ibm-openstack.zvm-driver.#host.config_drive.inject_password**: Define whether to place the password in the config drive. If **inject_password** is set to *False*, the default os root password of the new booted virtual machine is the password in data bag **user_passwords.zlinuxroot**. If **inject_password** is set to *True*, the default os root password can be set using Nova user-data. If you do not specify the password in nova user-data, the default os root password is a random value of *adminPass* property that is shown in the output of the virtual machine boot console.
- **ibm-openstack.zvm-driver.#host.scsi_pool**: Specify the name of the xCAT SCSI pool. You can specify any name. xCAT creates and manages it.
- **ibm-openstack.zvm-driver.#host.fcp_list**: Specify the list of FCPs used by instances. Each instance needs one FCP to attach a volume to itself. Those FCPs should be well planned and made online before OpenStack can use them. OpenStack does not check their status, so if they are not ready, you might receive errors. The format of this variable should look like '*min1-max1;min2-max2;min3-max3*'. Contact your z/VM system manager if you do not know what FCPs you can use.
- **ibm-openstack.zvm-driver.#host.zhcp_fcp_list**: Specify the list of FCPs used only by xCAT HCP node. It must be different from *zvm_fcp_list* or you receive errors. The format of this variable should look like *'min1-max1;min2-max2;min3-max3'*. Only specify one FCP for HCP to avoid wasting resources. Contact your z/VM system manager if you do not know what FCPs you can use.
- **ibm-openstack.zvm-driver.#host.external_vswitch_mappings**: Set the OSA configuration for each of the virtual switches. These configurations are required if the virtual switch connects outside of z/VM. The format of this variable is *'xcatvsw2:6243,6245;xcatvsw3:6343'*. Where *xcatvsw2* and *xcatvsw3* are the virtual switches and *6243, 6245, 6343* are RDEV addresses of the OSA cards that are connected to the virtual switch.
- **ibm-openstack.zvm-driver.#host.ml2.flat_networks**: Add your z/VM flat networks. For example, *xcatvsw1flat*.
- **ibm-openstack.zvm-driver.#host.ml2.network_vlan_ranges**: Add your z/VM network VLAN range. For example, *xcatvsw1vlan:10:100*.

5. Copy the following example topology to a file, `your-topology-name.json`. Change **your-topology-name** to the name for your topology. Here is an example topology with z/VM compute nodes.

```
{
  "name":"CHANGEME",
  "description":"CHANGEME",
  "environment":"CHANGEME",
  "secret_file":"CHANGEME",
  "run_sequentially":false,
  "nodes": [
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":1,
      "runlist": [
         "role[ibm-os-single-controller-node]",
         "role[ibm-os-prs-ego-master]",
         "role[ibm-os-prs-controller-node]",
         "role[ibm-sce-node]"
     ]
    },
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":2,
      "runlist": [
        "role[ibm-os-zvm-driver-node]",
        "role[ibm-os-prs-compute-node]"
      ],
        "attribute_file":"CHANGEME"
    }
  ]
}
```

6. Customize the topology file.
   a. The first node in your topology file is your single controller node. The second node in your topology file is for a compute node. If your topology requires extra compute nodes, copy the compute node section as many times as needed. Ensure that additional compute node sections are comma-separated.
   b. Change the following JSON attributes in your topology file, `your-topology-name.json`:
      - **`Name`**: Set to your topology name: *your-topology-name*.
      - **`Description`**: Set to the description for your topology.
      - **`Environment`**: Set to the environment for your topology: *your-environment-name*.
      - **`nodes.fqdn`**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
      - **`nodes.password`** or **`nodes.identity_file`**: For each node, set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute for each node.
   c. Create node-specific attribute files. You can create the attribute file for each node you deploy. The following example shows a node-specific attribute file for a z/VM compute node. The example file that is shown creates two compute services in the node. Reference Step 4 to review what each attribute stands for.

      In addition, you must update occurrences of *CHANGEME* to the actual value. You can also change the default values and hosts in the examples.

```
{
  "ibm-openstack": {
     "zvm-driver" :{
         "hosts" : ["zvm1","zvm2"],
         "zvm1" : {
            "xcat": {
               "username": "CHANGEME",
               "server": "CHANGEME",
               "zhcp_nodename": "CHANGEME",
               "master": "CHANGEME",
               "mgt_ip": "CHANGEME",
               "mgt_mask": "CHANGEME"
            },
            "ml2": {
               "type_drivers": "local,flat,vlan,gre",
               "tenant_network_types": "vlan",
               "flat_networks": "CHANGEME",
               "network_vlan_ranges": "CHANGEME"
             },
            "config": {
               "ram_allocation_ratio": "3"
            },
            "image": {
               "tmp_path": "/var/lib/nova/images",
               "cache_manager_interval": "86400"
            },
            "config_drive": {
               "format": "tgz",
               "inject_password": "false"
            },
            "diskpool" : "CHANGEME",
            "diskpool_type" : "CHANGEME",
            "zvm_host" : "CHANGEME",
            "host" : "CHANGEME",
            "user_profile" : "CHANGEME",
            "scsi_pool" : "CHANGEME",
            "fcp_list" : "CHANGEME",
            "zhcp_fcp_list" : "CHANGEME",
            "external_vswitch_mappings": "CHANGEME"
         },
       "zvm2" : {
            "xcat": {
               "username": "CHANGEME",
               "server": "CHANGEME",
               "zhcp_nodename": "CHANGEME",
               "master": "CHANGEME",
               "mgt_ip": "CHANGEME",
               "mgt_mask": "CHANGEME"
            },
            "ml2": {
               "type_drivers": "local,flat,vlan,gre",
               "tenant_network_types": "vlan",
               "flat_networks": "CHANGEME",
               "network_vlan_ranges": "CHANGEME"
            },
            "config": {
               "ram_allocation_ratio": "3"
            },
            "image": {
               "tmp_path": "/var/lib/nova/imagesCHANGEME",
               "cache_manager_interval": "86400"
            },
            "config_drive": {
               "format": "tgz",
               "inject_password": "false"
            },
            "diskpool" : "CHANGEME",
            "diskpool_type" : "CHANGEME",
            "zvm_host" : "CHANGEME",
            "host" : "CHANGEME",
            "user_profile" : "CHANGEME",
            "scsi_pool" : "CHANGEME",
            "fcp_list" : "CHANGEME",
            "zhcp_fcp_list" : "CHANGEME",
            "external_vswitch_mappings": "CHANGEME"
       }
     }
   }
}
```

After creating the node-specific attribute files, add the **nodes.attribute_file** JSON attributes in your topology file, your-topology-name.json:

- nodes.attribute_file: For each node, set to the attribute JSON file that overrides the attributes in the **default_attributes** section of the environment file.

7. Customize the passwords and secrets before deploying. You must change the passwords of the xCAT administrator *xcat*, the xCAT mnadmin user *xcatmnadmin*, and any instances that are created by the z/VM root user *zlinuxroot* in the user_passwords data bag. For instructions, see "Customizing passwords and secrets" on page 114.
8. (Optional) Complete any optional customizations. For options, see "Deployment customization options" on page 109.

   Note: Some customization options might not be supported for all hypervisor types and some cannot be configured after you deploy your cloud environment.
9. Deploy your topology.
   a. Upload the environment for your deployment.
   ```
   $ knife environment from file your-environment-name.json
   ```
   b. Deploy the topology.
   ```
   $ knife os manage deploy topology your-topology-name.json
   ```
   c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.
   ```
   $ knife os manage services status –-topology-file your-topology-name.json
   ```
10. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at https://controller.fqdn.com/, where **controller.fqdn.com** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at https://controller.fqdn.com:18443/cloud/web/login.html. You can log into either using *admin* user with the password that you customized in step 7.

    For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

What to do next

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Related reference:

"Troubleshooting errors when deploying or updating topologies" on page 301
If a topology deployment or update fails, review the log output from the deployment command for more information.

Configure the Image Service

"Creating initial networks" on page 155
After you deploy the components for creating a cloud environment, you can create several different types of networks.

Deploying to manage to PowerVC

Deploy the components that are necessary to create a test or production cloud to manage to PowerVC. You can complete the deployment with either a prescribed or advanced configuration.

Deploying a prescribed configuration to manage to PowerVC:

Deploy the components that are necessary to create a cloud environment to manage to PowerVC using a prescribed cloud configuration.

Before you begin

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

About this task

The following information provides details about this prescribed configuration.

Table 29. Summary of prescribed configuration

Component	Configuration
OpenStack Components	Identity, Image, Network, Compute, Orchestration, Block Storage, Telemetry, and Dashboard
OpenStack Networking	Neutron with ML2 plugin using Open vSwitch mechanism driver
OpenStack Network Types Supported	VLAN
OpenStack compute scheduler	Compute scheduler filters
OpenStack Block Storage Driver	OpenStack PowerVC driver
Database	IBM DB2 (default) or MySQL
Message Queue	RabbitMQ (default) or Qpid
Virtualization Manager	PowerVC
Self-service portal	Enabled (default) or disabled

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.

   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```

3. Copy the example cloud file to use as the base structure for your cloud deployment and rename it for your cloud environment.

   Note: This step assumes you used the default IBM Cloud Manager with OpenStack installation path on the deployment server (`/opt/ibm/cmwo`).

   In the following command, change *your-cloud*.yml to the name for your cloud.

   ```
   $ cp /opt/ibm/cmwo/cli/config/example-controller-powervc-driver-cloud.yml your-cloud.yml
   ```

4. Change the required YAML attributes in your cloud file, *your-cloud*.yml.
   - **Cloud Information (cloud)**: Customize the cloud information.
     a. **`name`**: Set the name for your cloud. The name cannot contain spaces or special characters. This name is also used as the OpenStack region name.
     b. **`password`**: Set the cloud administrator (admin) user's password.
   - **Node Information (nodes)**: Customize the information for your cloud controller node. This node runs the IBM Cloud Manager with OpenStack PowerVC driver services. The services connect to your existing PowerVC environment.
     a. **`name`** and **`description`**: Leave these set to the default values provided.

   b. **fqdn**: Set to the fully qualified domain name of the node system. The deployment system must be able to **SSH** using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
   c. **password** or **identity_file**: Set to the appropriate SSH root user authentication for the node system. You can use either a password or a SSH identity file for authentication.
   d. **nics.management_network**: Set to the management network interface card for the node system. This network is used for IBM Cloud Manager with OpenStack communication between the nodes in the cloud. The **fqdn** setting for the node must resolve to the IP address of this network. The default is *eth0*.
- **PowerVC Information (powervc)**: Customize the PowerVC information.
   a. **host**: Set to the fully qualified domain name or IP address of PowerVC.
   b. **admin_user**: Set to the PowerVC administrator's user name.
   c. **admin_password**: Set to the PowerVC administrator's password.
   d. **storage_connectivity_groups**: Set to the PowerVC storage connectivity groups that you want to make available in your cloud. The default is *Any host, all VIOS*. Add one storage connectivity group per line.

5. Optional: Complete any optional customization by changing the appropriate YAML attributes in your cloud file, *your-cloud*.yml.
   a. Optional: **Cloud Information (cloud)**: Customize the cloud information.
      - **database_service_type**: You can change the database that is used by OpenStack from DB2 (default) to MySQL by setting this attribute to *mysql*.
      - **messaging_service_type**: You can change the messaging queue that is used by OpenStack from RabbitMQ (default) to Qpid by setting this attribute to *qpid*.
      - **self_service_portal** and **self_service_portal_node_name**: IBM Cloud Manager with OpenStack features an easy to use self-service portal for performing cloud operations. You can disable the self-service portal cloud feature by setting the **self_service_portal** attribute to *disabled* and the **self_service_portal_node_name** attribute to ~.
   b. Optional: **Environment Information (environment)**: Customize the environment information.
      - **ntp.servers**: Set to the NTP servers that are accessible to your deployment. The list of NTP servers must be comma separated, for example, [*your.0.ntpserver.com*, *your.1.ntpserver.com*]. The default is [*0.pool.ntp.org*, *1.pool.ntp.org*, *2.pool.ntp.org*, *3.pool.ntp.org*].
6. Deploy your cloud.

   ```
   $ knife os manage deploy cloud your-cloud.yml
   ```

   Note: This command generates a topology file and other related files for your deployment and stores them in the same directory as your cloud file, *your-cloud*.yml. The cloud file is no longer needed after the deployment completes and can be removed. The generated files are only used if you must update your cloud.

   ```
   $ rm your-cloud.yml
   ```

7. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://node.fqdn.com/`, where `node.fqdn.com` is the fully qualified domain name of the node. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://node.fqdn.com:18443/cloud/web/login.html`. You can log into either using **admin** user with the password customized in step 4 on page 99.

   For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

Results

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Deploying an advanced configuration to manage to PowerVC:

Deploy the components that are necessary to create a cloud environment to manage to PowerVC using an advanced configuration.

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

Use the following procedure to deploy the topology to your node systems.

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **your-deployment-name** to the name for your deployment.
   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```
3. Copy the example environment for the topology that you deploy. Change **your-environment-name** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.
   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```
4. Configure the SSL client key and certificates for the PowerVC 1.2.2 message queue:
   a. Generate the SSL private key in the PowerVC driver controller node as follows:
      ```
      openssl genrsa -out key.pem  2048
      ```
   b. Generate a certificate request in the PowerVC driver controller node with the previously created private key. You must enter the subject for your controller node:

      Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.
      ```
      openssl req -new -key key.pem -out cert.csr -subj "/CN=c582f1-n36-vm1_pok_stglabs_ibm_com
      Messaging Client/O=PowerVC Driver"
      ```
      Note: Replace *'c582f1-n36-vm1_pok_stglabs_ibm_com'* with the name of your controller node.
   c. Copy the certificate request generated in the previous step to your PowerVC node.
   d. Sign the requested certificate by the PowerVC message queue certificate authority (CA), on thePowerVC node:

      Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.
      ```
      openssl ca -batch -config /etc/pki/messages/ca/openssl.conf -extensions client_ext
      -in cert.csr -out cert.pem -notext
      ```
   e. Copy the SSL certificate *'cert.pem'* and PowerVC message queue CA certificate, `/etc/pki/messages/ca/cacert.pem` from the PowerVC node to the PowerVC driver controller node.
   f. Set the SSL key, certificate, and PowerVC message queue CA files attributes. Below is the default SSL key, certificate, and CA files path (with line breaks for formatting purposes). Set these attributes to your generated (or copied) SSL key and certificate file path:

```
['ibm-openstack']['powervc-driver']['powervc']['rabbitmq']['ssl_keyfile_source'] =
    '/root/powervcmq_ssl/key.pem'
 ['ibm-openstack']['powervc-driver']['powervc']['rabbitmq']['ssl_certfile_source'] =
    '/root/powervcmq_ssl/cert.pem'
 ['ibm-openstack']['powervc-driver']['powervc']['rabbitmq']['ssl_ca_certs_source'] =
    '/root/powervcmq_ssl/cacert.pem'
```

5. Configure the PowerVC node with SSH access. If the PowerVC version is 1.2.2 or later, then SSH access is configured by default.
   - If already configured, skip to step 6.
   - If you do not configure the PowerVC node with SSH access, you must create the PowerVC Rabbit client user on the PowerVC side. To do so, run the following command in the PowerVC node:

     ```
     su - rabbitmq -c "/usr/lib/rabbitmq/bin/rabbitmqctl add_user <username><password>
     su - rabbitmq -c '/usr/lib/rabbitmq/bin/rabbitmqctl set_permissions -p / <username> ".*" ".*" ".*"'
     ```

     Then, disable the SSH access and set RabbitMQ client user and password in your environment file, `your-environment-name.json`:

     ```
     ['ibm-openstack']['powervc-driver']['powervc']['ssh']['access'] = false
     ['ibm-openstack']['powervc-driver']['powervc']['rabbitmq']['username'] = 'powervcdriver_mq'
     ```

     Note: The RabbitMQ client user password is set in user data bag item `'pvcrabbit'` in step 7.
6. Change the following JSON attributes in your environment file, `your-environment-name.json`:
   - **`Name`**: Set to your environment name: *your-environment-name*.
   - **`Description`**: Set to the description for your environment.
   - **`openstack.region`**: (Optional) Customize the region name for your cloud. The region name must not contain spaces or special characters.
   - **`openstack.endpoints.host`**, **`openstack.endpoints.bind-host`**, and **`openstack.endpoints.mq.host`**: Change from *127.0.0.1* to the IP address of the controller node system for the topology.
   - **`ibm-openstack.powervc-driver.powervc.admin_user`**: Specify the administrator for PowerVC.
   - **`ibm-openstack.powervc-driver.db_create`**: Set to *true* for PowerVC driver.
   - **`ibm-openstack.powervc-driver.powervc.host`**: Specify the host name for PowerVC.
   - **`ibm-openstack.powervc-driver.powervc.mq.service_type`**: Specify the message queue type for PowerVC. For PowerVC version 1.2.2 and later, set it as "`rabbitmq`". For PowerVC 1.2.0.X or 1.2.1.X, set it as "`qpid`".
   - **`ibm-openstack.powervc-driver.powervc.rabbitmq.ssl_keyfile_source`**: The SSL private key file path for the PowerVC message queue.
   - **`ibm-openstack.powervc-driver.powervc.rabbitmq.ssl_certfile_source`**: The SSL signed certificate file path for the PowerVC message queue.
   - **`ibm-openstack.powervc-driver.powervc.rabbitmq.ssl_ca_certs_source`**: The SSL CA file path for the PowerVC message queue.
   - **`ibm-openstack.powervc-driver.powervc.scg`**: Specify the PowerVC Storage Connectivity Group list that will be used by the PowerVC Driver.

   Note: Depending on your configuration, change the following values:
   - By default Neutron is set to use ML2 as the core plug-in. Set the following additional values:
     - **`openstack.network.ml2.tenant_network_types`** list *"vlan"* in the value list.
     - **`openstack.network.ml2.network_vlan_ranges`** list *"default:1:4094"* in the value list.
     - **`openstack.network.openvswitch.tenant_network_type`**: *"vlan"*
     - **`openstack.network.openvswitch.network_vlan_ranges`** list *"default:1:4094"* in the value list.
   - In a PowerVC only environment, where no other compute node is registered to a controller node that is running the PowerVC driver, the default configuration can be simplified. You do not need to set up a dedicated virtual machine data network. In the sample environment file, the GRE

network type is enabled by the default settings. However, since PowerVC does not support the GRE network type, set the following attributes to disable GRE and specify a valid network type.

- **openstack.network.openvswitch.bridge_mappings** = *""*
- **openstack.network.openvswitch.bridge_mapping_interface** = *""*
- **openstack.network.openvswitch.enable_tunneling** =*"False"*
- **openstack.network.openvswitch.tunnel_type** = *""*
- **openstack.network.openvswitch.tunnel_id_ranges** = *""*

For simplification, you can also disable the L3 agent and IP address movement functions if you choose. By default, they are both enabled as shown in the following default parameters.

- **openstack.network.l3.external_network_bridge** = *br-ex*
- **openstack.network.l3.external_network_bridge_interface** = *eth0*
- **ibm-openstack.network.ip_movement.enable** = *true*
- **ibm-openstack.network.l3.enable** = *true*

To disable the L3 agent and IP address movement, change *true* to *false* before deploying the controller node.

7. Copy the following example topology to a file, `your-topology-name.json`. Change **`your-topology-name`** to the name for your topology. Here is an example topology to manage to PowerVC.

```
{
  "name":"CHANGEME",
  "description":"CHANGEME",
  "environment":"CHANGEME",
  "secret_file":"CHANGEME",
  "run_sequentially":false,
  "nodes": [
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "run_order_number":1,
      "runlist": [
      "role[ibm-os-single-controller-node]",
      "role[ibm-os-powervc-driver-node]",
      "role[ibm-sce-node]"
      ]
    }
  ]
}
```

8. Customize the topology file. The node in your topology file is your single controller node that includes the PowerVC driver. Change the following JSON attributes in your topology file, `your-topology-name.json`:
   - **Name**: Set to your topology name: *your-topology-name*.
   - **Description**: Set to the description for your topology.
   - **Environment**: Set to the environment for your topology: *your-environment-name*.
   - **nodes.fqdn**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
   - **nodes.password** or **nodes.identity_file**: Set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute.
9. You must change the passwords in the **user_passwords** data bag to the actual password for the PowerVC administrator and PowerVC message queue client user.

   Enter the PowerVC *admin* password in the following Chef data bag:

```
`user_passwords` data bag's `pvcadmin` data bag item
```

Enter the PowerVC release 1.2.1.x or 1.2.0.x message queue client *user* password in the following Chef data bag:

```
`user_passwords` data bag's `pvcqpid` data bag item
```

Enter the PowerVC release 1.2.2 (or later) message queue client *user* password in the following Chef data bag:

```
`user_passwords` data bag's `pvcrabbit` data bag item
```

To change the passwords in *pvcadmin*, *pvcqpid*, or *pvcrabbit* data bags, see Customizing passwords and secrets.

10. (Optional) Complete any optional customizations. For options, see "Deployment customization options" on page 109.

    Note: Some customization options might not be supported for all hypervisor types and some cannot be configured after you deploy your cloud environment.

11. Deploy your topology.
    a. Upload the environment for your deployment.
    ```
    $ knife environment from file your-environment-name.json
    ```
    b. Deploy the topology.
    ```
    $ knife os manage deploy topology your-topology-name.json
    ```
    c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.
    ```
    $ knife os manage services status –-topology-file your-topology-name.json
    ```

12. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://controller.fqdn.com/`, where **`controller.fqdn.com`** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://controller.fqdn.com:18443/cloud/web/login.html`. You can log into either using *admin* user with the password that you customized in step 9.

    For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

You are ready to start using your cloud environment. To continue, see "Using your cloud environment" on page 144.

Deploying multi-region support

In a multi-region cloud environment, you can set up two separate deployments that use the same OpenStack Keystone server, but use different regions and different hypervisors.

About this task

Use the following instructions to build your own multi-region cloud environment. These instructions assume that you are familiar with the instructions for deploying a single-region cloud environment.

This example uses two regions for the multi-region cloud environment; however, you can have more than two regions. Also, this example uses a single deployment server to manage all of the regions. However, you can use a separate deployment server for each region. If separate deployment servers are used, they must have the same version of IBM Cloud Manager with OpenStack installed, but are allowed to have different fix pack levels. For more information about updates and release upgrades in these configurations, see "Best practices for maintaining a multi-region cloud or test cloud" on page 41.

Procedure

1. Create two directories to store the files for the multi-region cloud environment. One directory is used for region one and the second directory is used for region two.
2. Create two environment files, which are copied from the `example-ibm-os-single-controller-n-compute` example environment. One file is used for region one and the second file is used for region two.
3. Create two topology files that are based on the hypervisor that is used in each region. One file is used for region one and the second file is used for region two.
4. Update the environment and topology files for each region to support the multi-region cloud environment.
   a. In each region's environment file, update **`openstack.region`** to be the unique name for each region. The region name must not contain spaces or special characters.

      Note: For the Keystone configuration, the UUID authentication strategy is the default authentication strategy. The PKI authentication strategy must not be used for a multi-region topology.

   b. In each region's environment file, update the **`openstack.endpoint.identity-api.host`**, **`openstack.endpoints.identity-admin.host`**, and **`openstack.endpoints.identity-internal.host`** attributes to specify the node that contains the shared OpenStack Keystone server. The node can be any single controller node, within the multiple region cloud environment. The following example JSON snippet is added to the environment file inside **`override_attributes`** > **`openstack`** > **`endpoints`**, where X.X.X.X is the management IP address for the single controller node where the shared OpenStack Keystone server is located:

```
"identity-api": {
   "host": "X.X.X.X"
 },
 "identity-admin": {
   "host": "X.X.X.X"
 },
 "identity-internal": {
   "host": "X.X.X.X"
 }
```

      The other endpoint host attributes (**`openstack.endpoints.host`**, **`openstack.endpoints.bind-host`**, **`openstack.endpoints.mq.host`**, **`openstack-endpoints.db.host`**, and so on) reference the management IP address for the single controller node of the region

   c. If you want to use the self-service portal to manage your multi-region cloud environment, then each region's environment file must set **`ibm-sce.service.enabled`** to `true`. In addition, only one region's topology file can contain a node with the **`ibm-sce-node`** role. That is, only one self-service portal is supported in a multi-region cloud environment. The self-service portal can be installed in any region. If you do not want to use the self-service portal to manage your multi-region cloud environment, then each region's environment file must set **`ibm-sce.service.enabled`** to false. Neither region's topology file can contain a node with the **`ibm-sce-node role`**.

   d. Customize the passwords and secrets for each region. Since each region uses the same OpenStack Keystone server, the data bag items that are related to OpenStack Keystone must have the same passwords in all regions. Other passwords and secrets can be unique for each region. For more information about customizing passwords and secrets, see "Customizing passwords and secrets" on page 114.

      The following passwords and secrets must be the same between the regions. For more information on the data bags that are referenced, see "Data bags" on page 277.

      - Shared passwords and secrets in the **`secrets`** data bag:

```
openstack_identity_bootstrap_token
openstack_simple_token
```

      - All passwords and secrets in the **`service_passwords`** data bag are shared.

- Shared passwords and secrets in the **user_passwords** data bag:

  ```
  admin
  sceagent
  ```

  Note: You can use the following command to determine the current passwords and secrets for the first region. The command downloads and decrypts the data bags that contain the passwords and secrets for the first region and stores them in the data_bags directory. The directory also contains a passwords and secrets JSON file, region-one-environment-name_passwords_file.json, that can be used to set the passwords and secrets for the second region. Ensure that you remove the data_bags directory after you are done using it.

  ```
  $ knife os manage get passwords --topology-file topology_region_one.json data_bags
  ```

e. The remaining environment and topology file updates are normal updates for a stand-alone deployment. However, the same database service (DB2 or MySQL) and messaging service (Qpid) must be used for each region.

5. Deploy the topology for the region that contains the shared OpenStack Keystone server:

   ```
   $ knife os manage deploy topology topology_region_one.json
   ```

6. Deploy the topology for the remaining region:

   ```
   $ knife os manage deploy topology topology_region_two.json
   ```

7. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.

   ```
   $ knife os manage services status –-topology-file your-topology-name.json
   ```

8. (Self-service portal): If the self-service portal is installed, restart the IaaS gateway service on the node where the shared OpenStack Keystone server is running. Run the **service openstack-iaasgateway restart** command to restart the service. Then, restart the self-service portal service on the node where it is installed. Run the **service sce restart** command to restart the service. After you restart the services, you can add an OpenStack cloud connection for the additional region. For more information, see "Adding an OpenStack cloud configuration" on page 234.

   Note: Only one self-service portal must be installed to manage the multiple regions.

What to do next

For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

Deploying multiple hypervisor types

Use this information to deploy the components that are necessary to create a cloud environment with multiple hypervisor types.

About this task

It is possible to configure different types of hypervisors in the same OpenStack environment.

The following example shows how to build a dual hypervisor type environment using IBM Cloud Manager with OpenStack. The example uses the following system setup:

- System 1: This is the deployment system where IBM Cloud Manager with OpenStack is installed.
- System 2: The OpenStack single controller node.
- System 3: The OpenStack x86 Linux Kernel-based Virtual Machine (KVM) compute node.
- System 4: The OpenStack PowerKVM compute node.

Important: This procedure is for example purposes only.

Procedure

1. Install IBM Cloud Manager with OpenStack on system 1. For instructions, see “Installing IBM Cloud Manager with OpenStack on Linux” on page 21.
2. Follow the deployment prerequisites for all systems. See “Deploying prerequisites” on page 74 for details.
3. From system 1, complete the following steps.
   a. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.

   ```
   $ mkdir your-deployment-name
   $ chmod 600 your-deployment-name
   $ cd your-deployment-name
   ```

   b. Copy the example environment for the topology that you deploy. Change **`your-environment-name`** to the name for your environment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   $ knife environment show example-ibm-os-single-controller-n-compute -d -Fjson
   > your-environment-name.json
   ```

   c. Create a topology file that is based on the following example topology file, `your-topology-name.json`.

   ```
   {
     "name":"CHANGEME",
     "description":"CHANGEME",
     "environment":"CHANGEME",
     "secret_file":"CHANGEME",
     "run_sequentially":false,
     "nodes": [
       {
         "fqdn":"CHANGEME_TO_SYSTEM2",
         "password":"CHANGEME",
         "quit_on_error":true,
         "run_order_number":1,
          "runlist": [
         "role[ibm-os-single-controller-node]",
        "role[ibm-sce-node]"
       ]
       },
       {
         "fqdn":"CHANGEME_TO_SYSTEM3",
         "password":"CHANGEME",
         "quit_on_error":true,
         "run_order_number":2,
         "runlist": [
           "role[ibm-os-compute-node-kvm]"
         ]
       },
       {
         "fqdn":"CHANGEME_TO_SYSTEM4",
         "password":"CHANGEME",
         "quit_on_error":true,
         "run_order_number":2,
         "runlist": [
           "role[ibm-os-compute-node-powerkvm]"
         ]
       }
     ]
   }
   ```

4. From system 1, modify the environment and topology files for the deployment. See “Deploying a test or production cloud” on page 77 for details.
5. From system 1, deploy your topology.

a. Upload the environment for your deployment.

```
$ knife environment from file your-environment-name.json
```

b. Deploy the topology.

```
knife os manage deploy topology your-topology-name.json
```

c. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.

```
$ knife os manage services status –-topology-file your-topology-name.json
```

6. After the deployment is complete, the IBM Cloud Manager with OpenStack services are ready to use. The IBM Cloud Manager with OpenStack dashboard is available at `https://controller.fqdn.com/`, where **`controller.fqdn.com`** is the fully qualified domain name of the controller node in your topology. The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://controller.fqdn.com:18443/cloud/web/login.html`. You can log into either using *admin* user with the password that you customized in your deployment.

   For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

Related reference:

"Troubleshooting errors when deploying or updating topologies" on page 301
If a topology deployment or update fails, review the log output from the deployment command for more information.

"Roles" on page 287
The following roles are provided in support of the reference topologies.

Stand-alone self-service portal for managing VMware clouds

Deploy the components that are necessary to use IBM Cloud Manager with OpenStack self-service portal to manage your VMware clouds.

Before you begin

Before you begin, ensure you completed the "Deploying prerequisites" on page 74 steps.

About this task

Use the following procedure to deploy the topology to your node systems.

Procedure

1. Log in to the deployment system as the *root* user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a directory to store the files for the topology that you deploy. Change **`your-deployment-name`** to the name for your deployment.

```
$ mkdir your-deployment-name
$ chmod 600 your-deployment-name
$ cd your-deployment-name
```

3. Copy the example environment for the topology that you deploy. Change **`your-environment-name`** to the name for your environment.
4. Change the following JSON attributes in your environment file, `your-environment-name.json`:
   - **`Name`**: Set to your environment name: your-environment-name.
   - **`Description`**: Set to the description for your environment.
5. Copy the following example topology to a file, `your-topology-name.json`. Change **`your-topology-name`** to the name for your topology.

```
{
  "name":"CHANGEME",
  "description":"CHANGEME",
  "environment":"CHANGEME",
  "run_sequentially":true,
  "nodes": [
    {
      "fqdn":"CHANGEME",
      "password":"CHANGEME",
      "identity_file":"CHANGEME",
      "quit_on_error":true,
      "runlist": [
        "role[ibm-sce-node]"
      ]
    }
  ]
}
```

6. Change the following JSON attributes in your topology file, `your-topology-name.json`:
   a. **`Name`**: Set to your topology name: *your-topology-name*.
   b. **`Description`**: Set to the description for your topology.
   c. **`Environment`**: Set to the environment for your topology: *your-environment-name*.
   d. **`nodes.fqdn`**: For each node, you must set to the fully qualified domain name of the node system. The deployment system must be able to ssh by using the fully qualified domain name. You can also set to the public IP address, private IP address, or host name.
   e. **`nodes.password`** or **`nodes.identity_file`**: Set to the appropriate SSH root user authentication for the node system. Either a password and an SSH identity file can be used for authentication. Remove the unused attribute.
7. Customize the administrator (admin) user's password before deploying. For instructions, see "Customizing passwords and secrets" on page 114.
8. Deploy your topology.
   a. Upload the environment for your deployment.

      ```
      $ knife environment from file your-environment-name.json
      ```
   b. Deploy the topology.

      ```
      $ knife os manage deploy topology your-topology-name.json
      ```
   c. (Optional) check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.

      ```
      $ knife os manage services status --topology-file your-topology-name.json
      ```

Results

The web interface for IBM Cloud Manager with OpenStack self-service portal is available at `https://`*`node.fqdn.com`*`:18443/cloud/web/login.html`, where *node.fqdn.com* is the fully qualified domain name for the node on which you deployed the self-service portal. You can log in using admin user with the password customized in Step 7.

Deployment customization options

Configure these basic and advanced customization options before deploying your cloud environment.

Note:

- With some customization options, you can also configure them after you deploy your cloud environment.
- Some cloud environments might not support certain customization options.

Customizing for a distributed database topology

To customize your deployment for a distributed database topology then you must update your environment and topology files.

About this task

The following information provides details about supported options.

Table 30. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	No
Supported topologies?	Distributed Database

Complete the following steps to update your environment and topology files.

Procedure

1. Change the following JSON attributes in the `override_attributes` section of your environment file, `your-environment-name.json`:
   - **`openstack.endpoints.db.host`**: Change from *127.0.0.1* to the IP address of the database node system for the topology.
   - **`mysql.root_network_acl`**: If you changed the database that is used by OpenStack from DB2® (default) to MySQL, then change this attribute to *['x.x.x.x', 'fqdn.node.com']* where *x.x.x.x* is the IP address and *fqdn.node.com* is the fully qualified domain name of the database node system for the topology.
2. Add the following database node system as the first node in your topology file, `your-topology-name.json`.

```
{
  "fqdn":"CHANGEME",
  "password":"CHANGEME",
  "identity_file":"CHANGEME",
  "quit_on_error":true,
  "run_order_number":0,
  "runlist": [
    "role[ibm-os-database-server-node]"
  ]
},
```

3. Modify the role for the controller node system in your topology file, `your-topology-name.json`. Change the **`"role[ibm-os-single-controller-node]"`** role to **`"role[ibm-os-single-controller-distributed-database-node]"`**.
4. To finish the customization, return to the relevant topology deployment process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Customizing the scheduler

The default scheduler for IBM Cloud Manager with OpenStack is IBM Platform Resource Scheduler. You can further customize your cloud deployment to use the Platform Resource Scheduler high availability topology. Alternatively, you can disable Platform Resource Scheduler and use the default OpenStack compute scheduler instead.

About this task

Platform Resource Scheduler provides additional resource optimization policies and the ability to add a high availability service policy. These optimization policies rely on live migration for virtual machines. To use these features, ensure that you enable live migration for IBM Cloud Manager with OpenStack by following the steps in "Configuring migration for a KVM node with NFS shared storage" on page 158. For more information about using resource optimization policies and HA service policies, see the Platform Resource Scheduler information, Resource optimization policies and HA service policy.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Related reference:

"Roles" on page 287
The following roles are provided in support of the reference topologies.

Platform Resource Scheduler online product documentation

Customizing for Platform Resource Scheduler high availability topology:

Use these instructions if you want to customize your deployment to use the IBM Platform Resource Scheduler high availability (HA) topology.

About this task

Table 31. Summary of support details

Support options	Details
Supported hypervisor types?	Hyper-V, KVM or QEMU, PowerKVM, and z/VM
Support for post-deployment customization?	No
Supported topologies?	All, except `Stand-alone self-service portal`

To customize for a Platform Resource Scheduler HA deployment, complete the following steps.

Procedure

1. Append the following Platform Resource Scheduler roles to the run list for the single controller, all compute nodes, and the Platform Resource Scheduler candidate node as follows:

```
# PRS roles to insert in the OpenStack single controller run list before the
# SCE role("role[ibm-sce-node]")

"role[ibm-os-prs-ego-master]",
"role[ibm-os-prs-controller-node]"

# PRS roles to append to an OpenStack compute nodes' run list

"role[ibm-os-prs-compute-node]"

# PRS candidate role to run on prs-candidate-node
# Ensure the "run_order_number" is the largest in topology file

{
  "fqdn": "prs-candidate-node.fqdn",
  "identity_file": "CHANGEME",
  "password": "CHANGEME",
  "quit_on_error": true,
  "run_order_number": 999,
  "runlist": [
    "role[ibm-os-prs-ego-candidate]"
  ]
}
```

Note: If you use Hyper-V as the hypervisor type, to enable Platform Resource Scheduler on your compute nodes, complete the following steps:

a. Update the `nova.conf` file, and append *ibm_notifications* to **`notification_topics`**. The following is an example:

   `notification_topics``=notifications,`*`ibm_notifications`*

b. Restart the IBM Cloud Manager with OpenStack compute service.

2. Customize the following attributes in your environment file, *your-environment-name*.json:
   - **`ibm-openstack.prs.ego.master_list`**: Set to your EGO master (OpenStack single controller) host FQDN and EGO master candidate hosts' FQDN.
   - **`ibm-openstack.prs.ego.failover.enabled`**: Set to true to enable EGO HA topology.
   - **`ibm-openstack.prs.ego.failover.share_dir`**: Set to the mount point of the NFS share directory on the EGO master and EGO master candidate hosts.
   - **`ibm-openstack.prs.ego.failover.mount_host`**: Set to the FQDN or IP address of your NFS server.
   - **`ibm-openstack.prs.ego.failover.mount_dir`**: Set to the NFS share directory exported by your NFS server.

   Here is an example environment file with Platform Resource Scheduler HA topology enabled:

```
"override_attributes": {
  ......
  "ibm-openstack": {
    "prs": {
      "ego": {
        "master_list": ["the-fqdn-of-ego-master", "the-fqdn-of-ego-candidate"],
        "failover": {
          "enabled": true,
          "share_dir": "/opt/share",
          "mount_host": "10.0.0.10",
          "mount_dir": "/opt/nfs_dir"
        }
      }
    }
  },
  ......
}
```

3. Customize optional Platform Resource Scheduler attributes in your environment file, *your-environment-name*.json, as described in "Customizing optional Platform Resource Scheduler attributes."
4. To finish the customization, return to the relevant topology deployment process and complete the remaining steps.

Customizing optional Platform Resource Scheduler attributes:

You can customize optional attributes for Platform Resource Scheduler when deploying or updating IBM Cloud Manager with OpenStack.

About this task

Table 32. Summary of support details

Support options	Details
Supported hypervisor types?	Hyper-V, KVM or QEMU, PowerKVM, and z/VM
Support for post-deployment customization?	Yes

Table 32. Summary of support details (continued)

Support options	Details
Supported topologies?	All, except `Stand-alone self-service portal`

Note: If you are using the prescribed configuration with KVM, QEMU, or PowerKVM, customize the optional YAML override_attributes in your cloud file.

Procedure

1. Customize the following optional attributes in your environment file, *your-environment-name*.json, under the override_attributes section before deploying IBM Cloud Manager with OpenStack.
   - **`ibm-openstack.prs.ego.clusteradmin`**: Set to your user account for the EGO cluster administrator. By default, this is *egoadmin*.
   - **`ibm-openstack.prs.ego.baseport`**: Set to your port range used by EGO services in the EGO master and EGO master candidate hosts. By default, this is *7869* which means EGO services will use a port range of 7869 to 7879.
   - **`ibm-openstack.prs.policy_per_host_aggregate`**: Set to enable policy management for host aggregate based mode policies. By default, this is *false*.
   - **`ibm-openstack.prs.prs_ha_timeout_seconds`**: Set to the duration that a VM instance can attempt a live migration or cold migration operation before Platform Resource Scheduler times out with an error. By default, this is *1200* seconds.
   - **`ibm-openstack.prs.prs_mt_migration_preferred_order`**: Set to your preferred order when you put a hypervisor host into maintenance mode and require migrating instances away from the hypervisor host. The available orders are *memory_mb.most*, *memory_mb.least*, *vcpus.most*, and *vcpus.least*. By default, this is *memory_mb.most*.
   - **`openstack.compute.scheduler.default_filters`**: Set to enable the scheduler feature. Refer to http://docs.openstack.org/juno/config-reference/content/section_compute-scheduler.html for available filters. By default, this is *RetryFilter AvailabilityZoneFilter RamFilter ComputeFilter ComputeCapabilitiesFilter* and *ImagePropertiesFilter*.
   - **`openstack.compute.config.cpu_allocation_ratio`**: Set the CPU over commit ratios for all compute nodes in a cluster. By default, this is *16.0*.
   - **`openstack.compute.config.ram_allocation_ratio`**: Set the memory over commit ratios for all compute nodes in a cluster. By default, this is *1.5*.
   - **`openstack.compute.config.disk_allocation_ratio`**: Set the disk over commit ratios for all compute nodes in a cluster. By default, this is *1.0*.
2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Disabling IBM Platform Resource Scheduler:

You can disable IBM Platform Resource Scheduler and use the default OpenStack compute scheduler.

About this task

Table 33. Summary of support details

Support options	Details
Supported hypervisor types?	Hyper-V, KVM or QEMU, PowerKVM, and z/VM
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

To disable IBM Platform Resource Scheduler, complete the following steps:

Procedure

1. Remove the following IBM Platform Resource Scheduler roles from the run list for the single controller, and from all compute nodes as follows:

   ```
   # PRS roles to remove from the OpenStack single controller's run list

    "role[ibm-os-prs-ego-master]",
    "role[ibm-os-prs-controller-node]"

    # PRS roles to remove from OpenStack compute nodes' run list

    "role[ibm-os-prs-compute-node]"
   ```

   Note: If you use Hyper-V as the hypervisor type, to disable IBM Platform Resource Scheduler on you compute nodes, complete the following steps:

   a. Update the `nova.conf` file, and remove *ibm_notifications* from **`notification_topics`**.
   b. Restart the IBM Cloud Manager with OpenStack compute service.
2. To finish the customization, return to the relevant topology deployment or update process and complete the remaining steps

Customizing passwords and secrets

You can customize the passwords and secrets that are used during the deployment process.

The following information provides details about supported options.

Table 34. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	No, see “Changing passwords and secrets” on page 147 for customization post-deployment.
Supported topologies?	All, except `Minimal`.

If you are deploying a **Minimal topology**, then all passwords and secrets are the same as their associated user name (for example, admin/admin). Customization is not enabled for the topology.

If you are deploying any other topology, then by default, all passwords, and secrets are obtained through encrypted data bags. An example secret key (**`/opt/ibm/cmwo/chef-repo/data_bags/example_data_bag_secret`**) and data bags (**`/opt/ibm/cmwo/chef-repo/data_bags/`**) are provided by the IBM Cloud Manager with OpenStack installation. The following steps guide you through customizing these examples for your deployment:

1. Copy and update the example passwords and secrets file. By default, this example file ensures that all passwords and secrets are randomly generated for your deployment. To explicitly set the user password for the cloud administrator (admin), change the password entry for **`admin`** from *RANDOM* to your desired password. The same can be done for the cloud messaging service user (*qpidclient* or *rabbitclient*). If you are deploying a cloud environment with PowerVC or z/VM, you must set the passwords for those environments as well. For more information about the passwords and secrets that are used by a deployment, see “Data bags” on page 277.

   ```
   $ cp /opt/ibm/cmwo/chef-repo/data_bags/example_passwords_file.json ./your_passwords_file.json
   ```

   Note: This step assumes the default IBM Cloud Manager with OpenStack installation path on the deployment server (`/opt/ibm/cmwo`).
2. Set the passwords and secrets for your deployment.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

```
$ knife os manage set passwords -E your-environment-name.json --secret-file your-secret-file
--topology-file your-topology-name.json your_passwords_file.json
```

This command also creates a secret key, `your-secret-file`, that is used to encrypt the data bags.

3. (z/VM only) Edit the following z/VM related data bag items: **`xcat`**, **`xcatmnadmin`**, and **`zlinuxroot`**. These values set host-specific passwords for z/VM and update the data bags.
   a. Download and decrypt the data bags that contain the passwords and secrets for your deployment. The information is stored in the `data_bags` directory. The `data_bags` directory contains a subdirectory for each data bag that is used by your deployment. The subdirectories contain the data bags items for your deployment. Ensure that you remove the `data_bags` directory when you are done using it.

      ```
      $ knife os manage get passwords --topology-file your-topology-name.json data_bags
      ```

   b. Edit the following data bag items: **`xcat`**, **`xcatmnadmin`**, and **`zlinuxroot`**.

      Here is an example using the data bag **`xcat`**, using `your_env_user_passwords/xcat.json`:

      ```
      {
            "id": "xcat",
            "xcat_server1": "CHANGEME",
            "xcat_server2": "CHANGEME"
          }
      ```

      You must change the **`xcat_server1`** (**`xcat_server2`**) to the corresponding value of the attribute *ibm-openstack.zvm-driver.#host.xcat.server* in your attribute file, and then change the password to match **`xcatmnadmin.json`**.

      Here is an example for data bag **`zlinuxroot`** item, using `your_env_user_passwords/zlinuxroot.json`:

      ```
      {
            "id": "zlinuxroot",
            "host1": "CHANGEME",
            "host2": "CHANGEME"
         }
      ```

      You must change the **`host1(host2)`** to the corresponding value of the attribute **`ibm-openstack.zvm-driver.hosts`** in your attribute file, and then change the password.

   c. Update the changed data bags.

      ```
      $ knife os manage update passwords --topology-file your-topology-name.json data_bags
      ```

   d. Remove the data bag directory because it is no longer needed.

      ```
      $ rm -rf data_bags
      ```

4. Remove your passwords and secrets file because it is no longer needed.

   ```
   $ rm –f your_passwords_file.json
   ```

   Note: You can use the following command to download and decrypt the data bags that contain the passwords and secrets for your deployment. The information is stored in the `data_bags` directory. The `data_bags` directory contains a subdirectory for each data bag that is used by your deployment. The subdirectories contain the data bags items for your deployment. Ensure that you remove the `data_bags` directory when you are done using it.

   ```
   $ knife os manage get passwords --topology-file your-topology-name.json data_bags
   ```

Related reference:

"Data bag item not found" on page 303
You might see an error in the log that a data bag item is missing.

"Data bags" on page 277
The following example data bags are provided in support of the IBM Cloud Manager with OpenStack topologies.

Customizing for a FIPS-compliant topology

Additional steps are required to configure your topology so that it is compliant with the Federal Information Processing Standards (FIPS) for cryptography modules.

About this task

The following information provides details about supported options.

Table 35. Summary of support details

Support options	**Details**
Supported hypervisor types?	All, except Hyper-V
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

To customize your deployment for a FIPS-compliant topology, you need to ensure that OpenStack components are configured to communicate with HTTPs. Then, you can set the related attributes in the environment file and deploy the topology.

Note: Most attributes are in the `override_attributes` section of your environment, while some attributes might be in the `default_attributes` section, depending on your topology.

Procedure

1. Create or configure the certificates. For a production environment, obtain the certificates from a trusted CA agency. You can also use the following steps to create the certificates for a non-production environment.
   a. Run the following commands:

   ```
   $ mkdir /etc/certs
   $ cd /etc/certs
   $ openssl genrsa -des3 -out server.key 2048
   ```

   You are asked to enter a passphrase. You can input whatever you choose, because the password is removed in a future step.

   ```
   $ openssl req -new -key server.key -out server.csr
   ```

   Note: This command requests that you enter some information. When you are asked for the Common Name, enter the public IP address of the proxy node.

   ```
   $ cp server.key server.key.org
   $ openssl rsa -in server.key.org -out server.key
   $ openssl x509 -req -days 9999 -in server.csr -signkey server.key -out server.crt
   ```

   b. Set the following values in the environment file:
   - **`ibm-openstack.apache-proxy.certfile`** = */PATH/TO/server.crt*
   - **`ibm-openstack.apache-proxy.certkeyfile`** = */PATH/TO/server.key*

   c. Optional: Copy this directory and the certificates to the same directory of the compute nodes. This step is not needed for the `Minimal` topology.
2. Complete the Apache proxy setup for each component API service. Set the following values in the environment file:
   - **`ibm-openstack.apache-proxy.enabled`** = *true*. This value is the switch to enable the proxy solution for FIPS. The default value is *false*. By setting this value to *true*, the system attempts to put an Apache proxy outside of each OpenStack API service.
   - **`openstack.endpoints.host`** = *PUBLIC_IP_ADDR of the controller node*. The default value in the environment file is 127.0.0.1.

- **openstack.endpoints.bind-host** = *127.0.0.1*. This value is the IP address that the OpenStack API services bind to. Ensure that you set the value to *127.0.0.1*, the default value.
- **openstack.endpoints.SERVICE.port** = *PROXY_PORT_FOR_EACH_SERVICE*. This value is the port that each API service listens to, where SERVICE is the OpenStack API services such as identity-admin/identity-api/network-api/compute-api. The default port number for each API service and the related proxy is the same. For example, the proxy for nova-api and the nova-api service itself both listen to the same port number, 8774. You can set different port numbers by changing these attributes. An exception is that the port number for the keystone proxy must not be modified.

3. Configure how you want the certificate to be verified. You can specify an insecure method or a certificate verification method. The insecure method explicitly allows the client to perform insecure SSL (https) requests, meaning the certificate from the server is not verified against any certificate authorities. Alternatively, the certificate verification method requires the certificates to be verified.
   a. For an insecure method of verification, set the insecure values to true. For example, the following values must be set to true:
      - **openstack.network.api.auth.insecure** = *true*
      - **openstack.network.nova.nova_api_insecure** = *true*
      - **openstack.compute.network.neutron.api_insecure** = *true*
      - **openstack.compute.api.auth.insecure** = *true*
      - **openstack.compute.image.glance_api_insecure** = *true*
      - **openstack.compute.block-storage.cinder_api_insecure** = *true*
      - **openstack.block-storage.api.auth.insecure** = *true*
      - **openstack.block-storage.image.glance_api_insecure** = *true*
      - **openstack.orchestration.api.auth.insecure** = *true*
      - **openstack.orchestration.clients.insecure** = *true*
      - **openstack.telemetry.api.auth.insecure** = *true*
      - **openstack.telemetry.service-credentials.insecure** = *true*
      - **openstack.image.api.block-storage.cinder_api_insecure** = *true*
      - **openstack.image.api.auth.insecure** = *true*
      - **openstack.image.registry.auth.insecure** = *true*
      - **openstack.dashboard.ssl_no_verify** = *"True"*
      - **ibm-openstack.iaas-gateway.keystone_insecure** - *true* if IaaS gateway is used.

   b. For the certificate verification method, set all of the CA file values to be the certificate file of the certificate authority. See the following examples:
      - **openstack.image.registry.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.image.api.block-storage.cinder_ca_certificates_file** = */PATH/TO/server.crt*
      - **openstack.network.api.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.network.nova.nova_ca_certificates_file** = */PATH/TO/server.crt*
      - **openstack.compute.network.neutron.ca_certificates_file** = */PATH/TO/server.crt*
      - **openstack.compute.api.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.compute.image.ssl.ca_file** = */PATH/TO/server.crt*
      - **openstack.compute.block-storage.cinder_ca_certificates_file** = */PATH/TO/server.crt*
      - **openstack.block-storage.api.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.orchestration.api.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.orchestration.clients.ca_file** = */PATH/TO/server.crt*
      - **openstack.telemetry.api.auth.cafile** = */PATH/TO/server.crt*
      - **openstack.telemetry.service-credentials.cafile** = */PATH/TO/server.crt*

    - **`openstack.image.api.auth.cafile`** = */PATH/TO/server.crt*
    - **`openstack.dashboard.ssl_cacert`** = */PATH/TO/server.crt*
    - **`openstack.dashboard.ssl_no_verify`** = *"False"*
    - **`ibm-openstack.iaas-gateway.keystone_ca_certs`** = *path to certificate authority* if IaaS gateway is used.
    - **`openstack.block-storage.image.glance_ca_certificates_file`** = */PATH/TO/server.crt*

4. Set the related attributes in the environment file.
    a. Set all of the "hash_algorithm" or "hash_algorithms" in the environment file to *sha256*. The default value for hash_algorithm is md5. For FIPS, a recommended algorithm is sha256. See the following examples:
        - **`openstack.identity.token.hash_algorithm`** = *sha256*
        - **`openstack.image.api.auth.hash_algorithms`** = *sha256*

    b. If **`auth_token`** is configured to use *memcached* (in other words, **`memcached_servers`** and **`memcache_security_strategy`** are set) and the deployer wants to protect the data, set the **`memcache_secret_key`** to a value that is at least 112 bits. You can generate a random 112+ bit string by reading from the following path: `/dev/random: head -c 15 /dev/random | base64`. For example, **`memcached_servers = localhost:11211`** and **`memcache_security_strategy`** are set to either MAC or ENCRYPT.
5. Before you enable FIPS, stop all OpenStack services and `httpd` services on the IBM Cloud Manager with OpenStack controller node.

    Tip: For the FIPS environment, it is suggested to have the Chef server and controller node on different nodes. Redeployment from a non-FIPS IBM Cloud Manager with OpenStack to a FIPS-compliant IBM Cloud Manager with OpenStack is supported only when the Chef-server node and controller node are on different nodes.
6. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

What to do next

You can use the following verification examples after the installation.

- Insecure method: add *--insecure* in the command. For example:
    - `nova --insecure list`
    - `nova --insecure image-list`
- Certificate verification method: the certificates need to be provided. For example:
    - `neutron --os-cacert /var/lib/neutron/keystone-signing/cacert.pem agent-list`
    - `heat --os-cacert /var/cache/heat/cacert.pem --ca-file /var/cache/heat/cacert.pem stack-list`

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing basic options

You can update the attributes in your environment file to customize basic options for your cloud environment.

Customizing NTP attributes:

You can change the NTP servers attribute in your environment file to modify the NTP servers used by the node systems throughout your topology deployment.

About this task

The following information provides details about supported options.

Table 36. Summary of support details

Support options	**Details**
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

Complete the following steps to customize your environment.

Procedure

1. Update the following attribute in the `override_attributes` section of your environment file.
   - **`ntp.servers`**: Set to the NTP servers accessible to your deployment.
2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing OpenStack attributes:

You can change the OpenStack attributes in your environment file to control logging, quotas and uploading images.

About this task

The following information provides details about supported options.

Table 37. Summary of support details

Support options	**Details**
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

Complete the following steps to customize your environment.

Procedure

1. Update the following attributes in your environment file. Most attributes are in the `override_attributes` section of your environment, while some of the logging attributes might be in the `default_attributes` section, depending on your topology
   - **`openstack.compute.config.quota_*`**, **`openstack.network.quota.*`**, and **`openstack.block-storage.quota_*`**: The environment file provides default quota settings for the IBM Cloud Manager with OpenStack compute, network, and block storage components. Set the quotas as needed for your deployment. If your deployment is part of a multi-region cloud environment, quotas settings are unique to each region. For more information, see the OpenStack manage quotas documentation.
   - **`openstack.image.upload_image`** and **`openstack.image.upload_images`**: These attributes allow an image to be uploaded to OpenStack as part of your deployment. **`openstack.image.upload_image`** is a set of key-value pairs where the key is the image name and the value is the URL location of the image. **`openstack.image.upload_images`** is a list of keys from **`openstack.image.upload_image`** that you want to upload. For example:

     ```
     "openstack": {
       "image": {
         "upload_image": {
           "myimage": "https://myimagesource.com/myimage"
         },
         "upload_images": [
           "myimage"
         ]
       }
     }
     ```
   - **`openstack.identity.debug`** and **`openstack.identity.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack identity service.
   - **`openstack.image.debug`** and **`openstack.image.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack image service.
   - **`openstack.network.debug`** and **`openstack.network.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack network service.
   - **`openstack.compute.debug`** and **`openstack.compute.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack compute service.
   - **`openstack.block-storage.debug`** and **`openstack.block-storage.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack block storage service.
   - **`openstack.telemetry.debug`** and **`openstack.telemetry.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack telemetry service.
   - **`openstack.orchestration.debug`** and **`openstack.orchestration.verbose`**: Set to *true* or *false* for the desired logging level for the OpenStack orchestration service.

   Note: For more information about customizing the OpenStack values, see the following configuration options. To map the OpenStack configuration file options to the IBM Cloud Manager with OpenStack attributes, see "Mapping attributes to services" on page 279.
   - cinder.conf (block-storage attributes) configuration options
   - glance-api.conf (image.api attribute) configuration options
   - glance-registry.conf (image.registry attribute) configuration options
   - keystone.conf (identity attributes) configuration options
   - nova.conf (compute attributes) configuration options
   - neutron.conf (network attributes) configuration options
2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more

than one node. Use the instructions that apply to your specific hypervisor for each compute node.
"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing database attributes:

You can customize the attributes for the database that is used by OpenStack.

Changing the database from DB2 (default) to MySQL:

You can change the database that is used by OpenStack from DB2 (default) to MySQL.

About this task

The following information provides details about supported options.

Table 38. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	No
Supported topologies?	All, except `Stand-alone self-service portal`

Update the following JSON attributes in your environment file, `your-environment-name.json`.

Note: The attributes are located in the `override_attributes` section of the environment file.

- **`openstack.db.service_type`**: Set to *mysql*.
- **`openstack.db.telemetry.nosql.used`**: Set to *false*.
- **`mysql.allow_remote_root`**: Set to *true*.
- **`openstack.endpoints.db.port`**: Remove this attribute from the environment file.
- **`openstack.db.telemetry.port`**: Remove this attribute from the environment file.

Note: MySQL requires the MySQL ruby gem. During deployment, this gem is downloaded and installed from the deployment server.

When complete, return to the relevant topology deployment process and complete the remaining steps.
Related tasks:
"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Customizing SSL attributes for DB2 database:

You can customize the SSL attributes for the DB2 database.

About this task

The following information provides details about supported options.

Table 39. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

IBM Cloud Manager with OpenStack includes the DB2 database with SSL enabled. To disable SSL, change the following attributes in your environment file.

Note: The attributes are located in the `override_attributes` section of the environment file.

- **`db2.ssl.enable`**: Set to *false*.
- **`openstack.endpoints.db.port`**: Set to *50000*.

To configure SSL to use your own private keys and certificates instead of the default private keys and certificates, change the following attributes in your environment file:

- `db2.ssl.cert_label`
- `db2.ssl.server_keydb_url`
- `db2.ssl.server_stash_url`
- `db2.ssl.client_keydb_url`
- `db2.ssl.client_stash_url`

The default value for `db2.ssl.cert_label` is *dbserver*. Set this attribute to your own certificate label name. The default value for each URL attribute is *nil*. You can set these attributes to your own available addresses.

The certificate database and stash files must be generated by IBM Global Security Kit (GSKit) tools. For more information about how to use GSKit to generate certificates, see Configuring Secure Sockets Layer (SSL) support in a DB2 instance.

IBM Cloud Manager with OpenStack includes the GSKit toolkit. After you install IBM Cloud Manager with OpenStack, locate the RPM packages in the following directory: `<`*`installation directory`*`>/yum-repo/openstack/juno/rhel6/`*`arch`*, where <*installation directory*> is the directory in which you installed IBM Cloud Manager with OpenStack and *arch* is either x86_64 or ppc64. The `yum-repo` file is created only when IBM Cloud Manager with OpenStack is deployed, so you can install the `gskcrypt64` and `gskssl64` RPM packages by sequence.

To finish the customization, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing the messaging service attributes:

You can change the messaging service used by OpenStack from RabbitMQ (default) to Qpid.

About this task

The following information provides details about supported options.

Table 40. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	No
Supported topologies?	All, except `Stand-alone self-service portal`

Update the following JSON attributes in your environment file, `your-environment-name.json`.

Note: The attributes are located in the `override_attributes` section of the environment file.

- **`openstack.mq.service_type`**: Set to *qpid*.
- **`openstack.mq.user`**: Set to *qpidclient*.
- **`openstack.compute.rpc_backend`**: Set to *nova.openstack.common.rpc.impl_qpid*.

To finish the customization, return to the relevant topology deployment process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Customizing memcached attributes:

You can change the limits for the memcached service.

About this task

The following information provides details about supported options.

Table 41. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

Update the following attributes in your environment file. The attributes are located in the `override_attributes` section of the environment file for the `Minimal` topology and in the `default_attributes` section for other topologies.

Example

- **`memcached.memory`**: Maximum memory in MB for memcached instances. The default value is 64.
- **`memcached.maxconn`**: Maximum number of connections to accept. The default value is 1024.
- **`memcached.max_object_size`**: Maximum size of an object to cache. The default value is 1 MB.

Note: To specify a value in KB or MB, use *k* and *m*. For example, *1k* or *1m*. The minimum value is *1k* and the maximum value is *128m*.

To finish the customization, return to the relevant topology deployment and update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing the IaaS gateway:

The IaaS gateway is a part of IBM Cloud Manager with OpenStack.

About this task

It is a light-weight proxy middleware container capable of providing pluggable adaptation to normalize interactions across multiple IaaS cloud provider vendors.

The following information provides details about supported options.

Table 42. Summary of support details

Support options	**Details**
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

Complete the following steps to customize your environment.

Procedure

1. Customize the `iaasgateway` attributes. You can update the following attributes in your environment file to customize the **`ibm-openstack.iaasgateway.*`** attributes.

   Note: The attributes are located in the `override_attributes` section of the environment file.

   - **`ibm-openstack.iaas-gateway.iaasgateway_ip`**: The default value for this attribute binds to the management IP address specified by the **`openstack.endpoints.host`** value. If you want this value to be different from the **`openstack.endpoints.host`** value, set this attribute individually.
   - **`ibm-openstack.iaas-gateway.listen_port`**: The default value for this attribute is *9973*. With the default value, the **`iaasgateway`** listens to port 9973.
   - **`ibm-openstack.iaas-gateway.logging.enabled`**: The default value for this attribute is *true*. With the default value, when you start the **`iaasgateway`**, it logs basic information.
   - **`ibm-openstack.iaas-gateway.logging.debug`**: The default value for this attribute is *false*. With the default value, only the informational level (*INFO*) messages are logged. If you want more detailed messages, set this value to *true*.
2. Manage the license. After `iaasgateway` is installed, there are some default licenses installed in `/etc/iaasgateway/ssl` that expire in 10 years. If you want to provide you own certifications, replace them with the same name or use the environment to set them before using IBM Cloud Manager with OpenStack or deploying the controller node. If you use the environment to set the values, you must

add the following attributes into the environment. For more information about how to create a license and its expiration date, see http://www.openssl.org/docs/apps/openssl.html.

- **ibm-openstack.iaas-gateway.ssl.certfile_url**: The default value for this attribute is *nil*. The value must be a url where you can download the certification file. If you set this value, both of the following values must be set, otherwise this setting does not work.
- **ibm-openstack.iaas-gateway.ssl.keyfile_url**: The default value for this attribute is *nil*. The value must be a url where you can download the key file. If this value is not *nil*, then **certfile_url** and **ca_certs_url** cannot be nil, or this setting does not work.
- **ibm-openstack.iaas-gateway.ssl.ca_certs_url**: The default value for this attribute is *nil*. The value must be a url where can download the ca file. If this value is not nil, then **certfile_url** and **keyfile_url** cannot be nil, or this setting does not work.

3. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing advanced options

You can update the attributes in your environment file to customize advanced options for your cloud environment.

Customizing SELinux attributes:

You can change the SELinux attribute in your environment file to modify the SELinux state on the node systems to which you deploy a topology.

About this task

The following information provides details about supported options.

Table 43. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except Stand-alone self-service portal

Complete the following steps to customize your environment.

Procedure

1. Update the following attributes in your environment file. The attributes are located in the override_attributes section of the environment file for the Minimal topology and in the default_attributes section for other topologies.

   selinux.state

   The default value for this attribute is *nothing*. With the default value, the SELinux state is unchanged for the node systems in your topology. If you need to change the SELinux state on each node system, the attribute can be set to *enforcing*, *permissive* or *disabled*. For more information about SELinux, see the SELinux Project Wiki.

2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing iptables attributes:

You can change the iptables attributes in your environment file to control iptables rules customization, access to IBM Cloud Manager with OpenStack services, and SSH access on the nodes in your topology.

About this task

The following information provides details about supported options.

Table 44. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

Complete the following steps to customize your environment.

Procedure

1. You can update the following attributes in your environment file. The attributes are located in the `override_attributes` section of the environment file for the `Minimal` topology and in the `default_attributes` section for other topologies.

   `ibm-openstack.iptables.status`
   The default value for this attribute is *enabled*. With the default value, the iptables rules can be customized for the node systems in your topology using the other **`ibm-openstack.iptables.*`** attributes. If you want to manually configure the iptables for each node system, you must set this attribute to *unchanged*.

   `ibm-openstack.iptables.use_default_rules`
   When this attribute is set to *true* (default value), iptables rules are created to allow access to the IBM Cloud Manager with OpenStack services that are running on each node system.

   `ibm-openstack.iptables.include_ssh_default_rule`
   When this attribute is set to *true* (default value), iptables rules are created to allow SSH access to the node systems.

   `ibm-openstack.iptables.custom_rules`
   You can use this attribute to create custom iptables rules.

   Note: If you want to manually configure the iptables for each node system, you must set the **`ibm-openstack.iptables.status`** attribute to *unchanged*. The *unchanged* value will leave the iptables unchanged on each node system and allow your manual configuration to be maintained.

2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Customizing performance attributes:

You can change the performance attributes in your environment file to customize settings for item such as the message queue and workers.

About this task

The following information provides details about supported options.

Table 45. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`

The default values for the attributes are sufficient for most topology deployments. However, you might need to customize the values for heavily used deployments.

You can update the following attributes in the `override_attributes` section of your environment file.

Procedure

1. You can update the following JSON attributes in your environment file, `your-environment-name.json`, to customize the Qpid performance attributes. The Rabbitmq performance attributes do not need to be updated.

Table 46.

Attribute	Description
qpid.broker.max-connections qpid.broker.connection-backlog qpid.broker.worker-threads	• The default value for **`qpid.broker.max-connections`** is *1000*. • The default value for **`qpid.broker.connection-backlog`** is *10*. • The default value for **`qpid.broker.worker-threads`** is *20*. For more information about customizing these values, see the Qpid broker man page.
openstack.compute.rpc_thread_pool_size openstack.compute.rpc_conn_pool_size openstack.compute.rpc_response_timeout	• The default values for **`openstack.compute.rpc_thread_pool_size`** is *2048*. • The default value for **`openstack.compute.rpc_conn_pool_size`** is *60*. • The default value for **`openstack.compute.rpc_response_timeout`** is *60*.

Table 46. (continued)

Attribute	Description
openstack.network.rpc_thread_pool_size openstack.network.rpc_conn_pool_size openstack.network.rpc_response_timeout	- The default value for **openstack.network.rpc_thread_pool_size** is *128*. - The default value for **openstack.network.rpc_conn_pool_size** is *60*. - The default value for **openstack.network.rpc_response_timeout** is *300*.
openstack.compute.osapi_compute_workers openstack.identity.public_workers openstack.identity.admin_workers openstack.network.api_workers openstack.network.rpc_workers openstack.image.api.workers openstack.image.registry.workers openstack.block-storage.osapi_volume_workers openstack.compute.conductor.workers	- The default value for **openstack.identity.public_workers** and **openstack.identity.admin_workers** is the number of CPUs, with a minimum value of *2*. - The default value for **openstack.network.api_workers** and **openstack.network.rpc_workers** is *0*. - The default values for the remaining attributes are equal to the number of CPUs on the node system (with a maximum value of 8). Changes to the default values should be based on the number of CPUs that are available on the single controller node system. Some workers are limited to a maximum value of *8*.
openstack.sysctl.net.core.somaxconn	You can run the **sysctl net.core.somaxconn** command on the node systems in your topology to determine the default value for each node system. Heavily used deployments might require a minimum value of 512. **Note:** The attribute name for **net.core.somaxconn** includes the period (**.**) in the name.
ibm-openstack.powervc-driver.db.max_pool_size ibm-openstack.powervc-driver.db.max_overflow	If you plan to run a large-scale IBM Power Virtualization Center environment with up to 2,000 workloads, modify the values of the following attributes to enhance performance. - **ibm-openstack.powervc-driver.db.max_pool_size**=*50* - **ibm-openstack.powervc-driver.db.max_overflow**=*100*

You might need to increase the maximum file descriptor limit on the single controller node system in your topology. The message queue service runs on the single controller node. You can increase the maximum file descriptor limit by adding the following lines to the /etc/security/limits.conf file. After the update, new processes will use the new limit. Existing processes continue to use their current limit.

```
* soft nofile 65536
* hard nofile 65536
```

2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Configuring storage (Cinder)

Use this information to configure your storage environment if you want to use a storage driver that is different than the default, configure multiple block storage back ends, or create a cloud environment with extra block storage (Cinder) nodes.

Configuring Cinder drivers:

Use this information to configure Cinder storage drivers appropriately for IBM Cloud Manager with OpenStack.

Configuring LVM iSCSI Cinder driver:

By default, cloud topologies for IBM Cloud Manager with OpenStack are configured so that the controller node runs the block storage service (cinder-volumes) by using the LVM iSCSI Cinder driver. You can customize how the LVM group is created.

About this task

The LVM iSCSI Cinder driver is supported in the following environments:

Table 47. Summary of support details

Support options	Details
Supported hypervisor types?	KVM or QEMU, PowerKVM, and Hyper-V
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`
Storage (Cinder) node?	Controller or block storage node
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64 or ppc64

Complete the following steps to configure IBM Cloud Manager with OpenStack to use the LVM iSCSI Cinder driver.

Procedure

1. Add the following attributes as needed to your environment or node attribute file.

   Note: Attributes are added to one of the following depending on your topology:
   - Minimal topology (based on the example-ibm-os-allinone environment). Add the attributes to the `override_attributes` section of your environment file.
   - Controller +n compute topology (based on the example-ibm-os-single-controller-n-compute environment). Add attributes that are shared by all nodes to the `default_attributes` section of your environment file. Those attributes that are specific to individual nodes are added to the node attributes file.
   - **`openstack.block-storage.volume.driver`**: The default value is *cinder.volume.drivers.lvm.LVMISCSIDriver*
   - **`openstack.block-storage.volume.create_volume_group`**: The default value is set to *false*. To have IBM Cloud Manager with OpenStack create the volume group during deployment, set this value to *true*.
   - **`openstack.block-storage.volume.volume_group_name`**: Set this value to the name of the LVM volume group to be used. The default name is *cinder-volumes*.
   - **`openstack.block-storage.volume.iscsi_ip_address`**: Change from *127.0.0.1* to the IP address of the block storage node; this is the controller or a block storage node.
2. Determine how the LVM volume group will be created. IBM Cloud Manager with OpenStack can create the volume group automatically during the deployment process, or you can create the volume group manually before deploying the block storage nodes.

You can create a Linux Volume Manager (LVM) volume group that spans one or more physical block devices (entire disks or partitions). You can add block devices to the volume group later to increase capacity.

Use the following topics to customize how the LVM volume group is created.

3. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Creating the initial volume group as part of the deployment by using block devices:

The initial cinder-volumes volume group can be created as part of deploying your topology. Use these instructions to create the initial volume group that uses one or more block devices (disks).

About this task

The following information describes details about supported options.

Table 48. Summary of support details

Support options	Details
Supported hypervisor types?	KVM or QEMU, PowerKVM, and Hyper-V
Support for post-deployment customization?	Yes
Supported topologies?	All, except `Stand-alone self-service portal`
Storage (Cinder) node?	Controller or block storage node
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64 or ppc64

Procedure

1. Identify the block devices that you want to use on the block storage node. The block devices can be an entire disk (for example, `/dev/sdb`) or a partition (for example, `/dev/sdba`). You can use tools like **df** and **pvs** to identify devices that are used by existing mounted file system or LVM volume groups.
2. Modify the environment or node attributes file to contain the following additional attributes. The attributes are in the `override_attributes` section of the environment file for the Minimal topology and in the `default_attributes` section for other topologies:
   - **`openstack.block-storage.volume.create_volume_group`**: Set this value to *true*.
   - **`openstack.block-storage.volume.create_volume_group_type`** : Set this value to *"block_devices"*.
   - **`openstack.block-storage.volume.block_devices`**: Set this value to a list of the devices to be used in the volume group. Separate the devices with a space in between each device.

   The **`block_devices`** attribute accepts the following kinds of values:
   - A single device: *"/dev/sdb"*
   - A list of devices: *"/dev/sdb /dev/sdc"*
   - A pattern that matches multiple devices: *"/dev/sd[k-m]1"*. This pattern matches */dev/sdk1*, */dev/sdl1*, and */dev/sdm1*.

See the following example for configuring an LVM by using a block device.

```
{
 "openstack" : {
 "block-storage": {
      "volume": {
        "create_volume_group": true,
        "create_volume_group_type": "block_devices",
        "block_devices": "/dev/sdb",
      }
    }
  }
}
```

3. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Creating the initial volume group as part of the deployment by using a file-backed loop device:

The initial cinder-volumes volume group can be created as part of deploying your topology. Use these instructions to create the initial volume group that uses a file-backed loop device.

About this task

When you create a volume group that is backed by a file on the block storage node, the deployment process creates a file, /var/lib/cinder/cinder-volumes.img, and attaches a loop device, /dev/loopx, to the file. Additionally, it creates a service, **cinder-group-active**, that is used to reattach the loop device when the system is rebooted.

The following information describes details about supported options.

Table 49. Summary of support details

Support options	Details
Supported hypervisor types?	KVM or QEMU, PowerKVM, and Hyper-V
Support for post-deployment customization?	Yes
Supported topologies?	All, except Stand-alone self-service portal
Storage (Cinder) node?	Controller or block storage node
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64 or ppc64

Procedure

1. 1. Modify the environment or node attributes file to contain the following additional attributes. These attributes are in the override_attributes section of the environment file for the Minimal topology and in the default_attributes section for other topologies.
   - **openstack.block-storage.volume.create_volume_group**: Set this value to *true*.
   - **openstack.block-storage.volume.create_volume_group_type** : Set this value to *"file"*.

- **openstack.block-storage.volume.volume_group_size** : Set this value to the size of the volume group in GB. There must be enough free space on the file system to create the file. The default value is *40*.

2. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Creating an LVM volume group using physical disks:

Use the following instructions to create an LVM volume group on the block storage node or nodes.

About this task

The LVM iSCSI volume driver uses a volume group named "cinder-volumes" by default. These instructions use that name.

- Identify the block devices that you want to use on the block storage node. This can be an entire disk (for example, /dev/sdb) or a partition (for example, /dev/sdba). You can use tools like **df** and **pvs** to identify devices that are used by existing mounted file system or LVM volume groups.
- Create an LVM physical volume over each block device using the **pvcreate** command. To create an LVM physical volume for /dev/sdb, use this command:

  ```
  # pvcreate /dev/sdb
  ```
- Create a "cinder-volumes" LVM volume group using the physical volume or volumes you previously created:

  ```
  # vgcreate cinder-volumes /dev/sdb [additional devices]
  ```

Adding a block device to an existing LVM volume group:

Use the following instructions to add a block device to an existing LVM volume group on a block storage node. You can do this at any time.

About this task

- Identify the block devices that you want to use on the block storage node. This can be an entire disk (for example, /dev/sdb) or a partition (for example, /dev/sdba). You can use tools like **df** and **pvs** to identify devices that are used by existing mounted file system or LVM volume groups.
- Create an LVM physical volume over each block device using the **pvcreate** command. To create an LVM physical volume for /dev/sdb, use this command:

  ```
  # pvcreate /dev/sdb
  ```
- Extend the LVM volume group using the physical volume or volumes you previously created:

  ```
  # vgextend cinder-volumes /dev/sdb [additional devices]
  ```

Configuring IBM Storwize Cinder driver:

You can configure IBM Cloud Manager with OpenStack to use the IBM Storwize Cinder driver.

About this task

The IBM Storwize Cinder driver is supported in the following environments:

Table 50. Summary of support details

Support options	Details
Supported hypervisor types?	KVM or QEMU, PowerKVM, Hyper-V, and z/VM
Support for post-deployment customization?	Yes
Supported topologies?	All, except the following 2 topologies: • `Minimal` • `Stand-alone self-service portal`
Storage (Cinder) node?	Controller or block storage node
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64

Complete the following steps to configure IBM Cloud Manager with OpenStack to use the IBM Storwize Cinder driver.

Procedure

1. Create an SSH public / private key pair for authenticating to the SAN controller, or use an existing key pair. The public key should be placed on the SAN controller as described in the SAN storage documentation. Place the private key on the Cinder volume server (typically the controller node), and record its location for use below. The file permissions for this file are set during deployment so that it is owned and readable only by the OpenStack block storage user (Cinder).
2. Add the following attribute to the `default_attributes` section of your environment file.
   - **`openstack.block-storage.volume.driver`**: Set to *cinder.volume.drivers.ibm.storwize_svc.StorwizeSVCDriver*
3. Add the following attributes as needed to the `default_attributes` section of your environment file. The values for these attributes must be based on your IBM Storwize Cinder configuration.
   - **`openstack.block-storage.san.san_ip`**: IP address of SAN controller. The default value is *127.0.0.1*.
   - **`openstack.block-storage.san.san_login`**: User name for SAN controller. The default value is *admin*.
   - **`openstack.block-storage.san.san_private_key`**: File name of the private key to use for SSH authentication. The default is */v7000_rsa*.
   - **`openstack.block-storage.storwize.storwize_svc_volpool_name`**: Storage system storage pool for volumes. The default is *volpool*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_rsize`**: Storage system space-efficiency parameter for volumes. The default value is *2*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_warning`**: Storage system threshold for volume capacity warnings. The default value is *0*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_autoexpand`**: Storage system auto-expand parameter for volumes. The default is *true*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_grainsize`**: Storage system grain size parameter for volumes. The default is *256*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_compression`**: Storage system compression option for volumes. The default value is *false*.
   - **`openstack.block-storage.storwize.storwize_svc_vol_easytier`**: Enable Easy Tier® for volumes. The default value is *true*.
   - **`openstack.block-storage.storwize.storwize_svc_flashcopy_timeout`**: Maximum number of seconds to wait for FlashCopy® to be prepared. The default value is *120*.

- **openstack.block-storage.storwize.storwize_svc_vol_iogrp**: The I/O group in which to allocate volumes. The default value is *0*.
- **openstack.block-storage.storwize.storwize_svc_connection_protocol**: Connection protocol (iSCSI or Fibre Channel). The default value is *iSCSI*.

  Note: Only iSCSI is supported by Hyper-V compute nodes.
- **openstack.block-storage.storwize.storwize_svc_iscsi_chap_enabled**: Configure CHAP authentication for iSCSI connections. The default value is *true*.

  Note: If the compute node is Hyper-V, specify the value in the environment file as *false*.
- **openstack.block-storage.storwize.storwize_svc_multipath_enabled**: Connect with multipath (Fibre Channel only; iSCSI multipath is controlled by Nova). The default value is *false*.
- **openstack.block-storage.storwize.storwize_svc_multihostmap_enabled**: Allows vdisk to multi-host mapping. The default value is *true*.

4. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Configuring IBM Storwize V7000 Unified and IBM SONAS Cinder driver:

You can configure IBM Cloud Manager with OpenStack to use the IBM Storwize V7000 Unified and IBM Scale Out Network Attached Storage Cinder driver.

About this task

The IBM Storwize V7000 Unified and IBM SONAS Cinder driver is supported in the following environments:

Table 51. Summary of support details

Support options	Details
Supported hypervisor types?	KVM or QEMU, and PowerKVM
Support for post-deployment customization?	Yes
Supported topologies?	All, except the following 2 topologies: • `Minimal` • `Stand-alone self-service portal`
Storage (Cinder) node?	Controller or block storage node with NFS client installed
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64

Complete the following steps to configure IBM Cloud Manager with OpenStack to use the IBM Storwize V7000 Unified and IBM SONAS Cinder driver.

Procedure

1. Add the following attribute to the `default_attributes` section of your environment file.
   - **`openstack.block-storage.volume.driver`**: Set to *cinder.volume.drivers.ibm.ibmnas.IBMNAS_NFSDriver*.
2. Add the following attributes as needed to the `default_attributes` section of your environment file. The values for these attributes must be based on your IBM Storwize V7000 Unified and IBM SONAS Cinder driver configuration.
   - **`openstack.block-storage.ibmnas.nas_ip`**: Management IP address of IBM SONAS or IBM Storwize V7000 Unified storage. The default value is *127.0.0.1*.
   - **`openstack.block-storage.ibmnas.nas_login`**: User name to authenticate for IBM SONAS or IBM Storwize V7000 Unified storage. The default value is *admin*.
   - **`openstack.block-storage.ibmnas.nas_access_ip`**: Host name or public IP address to access shares. There is no default value.
   - **`openstack.block-storage.ibmnas.nas_ssh_port`**: SSH port to access shares. There is no default value.
   - **`openstack.block-storage.ibmnas.shares_config`**: File that contains a list of IBM SONAS or IBM Storwize V7000 Unified shares. The default value is */etc/cinder/nfs_shares.conf*.
   - **`openstack.block-storage.ibmnas.mount_point_base`**: Storage system mount point path for volume creation. The default value is */mnt/cinder-volumes*.
   - **`openstack.block-storage.ibmnas.nfs_sparsed_volumes`**: Storage system volume creation method. The default value is *true*.
   - **`openstack.block-storage.ibmnas.export`**: Storage system shares / export path parameter. There is no default value.
3. Create a data bag item in the user passwords data bag for your environment. This data bag item will contain the password to authenticate to the storage system.
   a. Create a directory for the user passwords data bag. Change *your_env_user_passwords* to the name of the user passwords data bag for your environment. The **`openstack.secret.user_passwords_data_bag`** attribute in your environment file contains the data bag name to use.

   ```
   $ mkdir -p data_bags/your_env_user_passwords
   $ chmod -R 600 data_bags/
   ```

   b. Create a data bag item with the following contents. The data bag item name must match the value of the **`openstack.block-storage.ibmnas.nas_login`** attribute. The following example assumes that the value is *your_data_bag_item_name*.

   ```
   $ cat data_bags/your_env_user_passwords/your_data_bag_item_name.json
   {
     "id": "your_data_bag_item_name",
     "your_data_bag_item_name": "CHANGE_TO_PASSWORD"
   }
   ```

   c. Upload the data bag item that you created in the previous step. Change *your-secret-key-name* to the secret key for your topology. The **`secret_file`** JSON attribute in your topology file contains the secret file to use.

   ```
   $ knife data bag from file your_env_user_passwords
   your_data_bag_item_name.json --secret-file your-secret-key-name
   ```

   d. Remove the local data bag item since it is no longer needed.

   ```
   $ rm -rf data_bags/
   ```
4. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Configuring IBM GPFS Cinder driver:

You can configure IBM Cloud Manager with OpenStack to use the IBM GPFS™ Cinder driver.

About this task

The IBM GPFS Cinder driver is supported in the following environments:

Table 52. Summary of support details

Support options	**Details**
Supported hypervisor types?	KVM or QEMU with GPFS client installed
Support for post-deployment customization?	Yes
Supported topologies?	All, except the following two topologies: • `Minimal` • `Stand-alone self-service portal`
Storage (Cinder) node?	Controller or block storage node with GPFS client installed
Operating system?	Red Hat Enterprise Linux 6.5
Architecture?	x86_64 or ppc64

Complete the following steps to configure IBM Cloud Manager with OpenStack to use the IBM GPFS Cinder driver.

Procedure

1. Add the following attribute to the `default_attributes` section of your environment file.
   - **`openstack.block-storage.volume.driver`**: Set to *cinder.volume.drivers.gpfs.GPFSDriver*.
2. Add the following attributes as needed to the `default_attributes` section of your environment file. The values for these attributes must be based on your IBM GPFS Cinder driver configuration.
   - **`openstack.block-storage.gpfs.gpfs_mount_point_base`**: Path to directory in GPFS file system where volume files are located. There is no default value.
   - **`openstack.block-storage.gpfs.gpfs_images_dir`**: Path to directory in GPFS file system where images are located. There is no default value.
   - **`openstack.block-storage.gpfs.gpfs_images_share_mode`**: Path to directory in GPFS file system where Glance images are located. The default value is *copy_on_write*.
   - **`openstack.block-storage.gpfs.gpfs_sparse_volumes`**: Create volumes as sparse or fully allocated files. The default value is *true*.
   - **`openstack.block-storage.gpfs.gpfs_max_clone_depth`**: Maximum clone indirections that are allowed when volume file snapshots clones are created. The default value is *8*.
   - **`openstack.block-storage.gpfs.gpfs_storage_pool`**: GPFS storage pool that volumes are assigned to. The default value is *system*.

   For more information about configuration parameters, see OpenStack information to Enable the GPFS driver.
3. When complete, return to the relevant topology deployment or update process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

Configuring XIV storage cookbook:

After you deploy a topology, you can configure the cookbook for IBM XIV® storage.

About this task

The IBM XIV Cinder driver is supported in the following environments:

- Storage (Cinder) node: Controller or block storage node
- Operating system: Red Hat Enterprise Linux 6.5
- Architecture: x86_64
- Compute nodes: KVM or QEMU

Complete the following steps to configure the XIV chef cookbook for IBM Cloud Manager with OpenStack.

Procedure

1. Ensure that you installed the latest fix pack. Then, follow these steps to extract and upload the XIV Cinder driver cookbook (xiv_ds8k) to the deployment server.
   a. Create a temporary directory to store the XIV Cinder driver cookbook.
   ```
   mkdir /tmp/xiv
   ```
   b. Extract the XIV Cinder driver cookbook to the temporary directory.
   ```
   tar -xvf /opt/ibm/cmwo/file-repo/xiv/xiv_ds8k_cookbook_0.2.1.tgz -C /tmp/xiv
   ```
   c. Upload the XIV Cinder driver cookbook to Chef.
   ```
   knife cookbook upload xiv_ds8k -o /tmp/xiv
   ```
2. Ensure that the python-setuptools RPM is included in the operating system yum repository before running the following command. For more information about configuring yum repositories, see "Configuring operating system yum repositories on the deployment server" on page 37.
3. Base 64 encode the password that is used to connect to the SAN storage:
   ```
   # echo -n <san-password> | base64
   ```
   The output is used as the *<base64 XIV Password>* below.

   Note: This cookbook does not currently support use of encrypted data bags.
4. Edit your environment file, adding the following to **override_attributes.openstack.block-storage**:
   ```
   "xiv_ds8k": {
     "san_ip": "<ip of XIV management>",
     "san_clustername": "<XIV POOL for Cinder>",
     "xiv_ds8k_connection_type": "iscsi",
     "xiv_chap": "disabled",
     "san_login": "<XIV Management Login>",
     "san_password": "<base64 XIV Password>",
   }
   ```
   Upload the modified environment to the Chef server.
5. Edit your topology file, `my-topology.json`, and add the following recipes to the end of the run list for the node that acts as the block storage server. The node can be the controller or a separate block storage node.

```
  "recipe[xiv_ds8k::install]"
  "recipe[xiv_ds8k::configure]"
```

The resulting run list might look like this:

```
"runlist": [
    "role[ibm-os-single-controller-node]",
    "recipe[xiv_ds8k::install]",
    "recipe[xiv_ds8k::configure]"
  ]
```

6. Finish deploying the topology as described in the directions for your hypervisor.

Configuring multiple block storage back ends:

When you deploy an IBM Cloud Manager with OpenStack topology, you can also configure multiple block storage back ends on the controller or a block storage node.

Before you begin

To configure multiple block storage back ends, ensure that the latest fix pack is installed.

About this task

You can also use this multiple block storage back ends technique when you configure block storage back ends on multiple servers to use a different **volume_backend_name** for each block storage node. To configure multiple block storage back ends, you can define an **openstack.block-storage.volume.multi_backend** table to configure each back end as part of the cloud environment or node attributes.

To configure multiple block storage back ends in the Chef environment, complete the following steps:

Procedure

1. Record the configuration for the `cinder.conf` properties as described in Configure multiple-storage back ends. The following example shows two storage back ends, lvm_1 and lvm_2:

```
[DEFAULT]
...
enabled_backends = lvm_1, lvm_2
...
[lvm_1]
volume_driver=cinder.volume.drivers.lvm.LVMISCSIDriver
volume_backend_name=lvm-1
volume_group=cinder-volumes-1
[lvm_2]
volume_driver=cinder.volume.drivers.lvm.LVMISCSIDriver
volume_backend_name=lvm-2
volume_group=cinder-volumes-2
```

2. Convert the information from the previous step to a JSON map for the **openstack.block-storage.volume.multi_backend** attribute that has an entry for each back end configuration file section (lvm_1, lvm_2). Each of these JSON entries is a map that contains the property name and value pairs for each property in the section. The example from the previous step would look like the following example:

```
{
  "openstack" : {
    "block-storage" : {
      "volume" : {
        "multi_backend" : {
          "lvm_1" : {
            "volume_driver" : "cinder.volume.drivers.lvm.LVMISCSIDriver",
            "volume_backend_name" : "lvm-1",
            "volume_group" : "cinder-volumes-1"
          },
          "lvm_2": {
             "volume_driver" : "cinder.volume.drivers.lvm.LVMISCSIDriver",
            "volume_backend_name" : "lvm-2",
            "volume_group" : "cinder-volumes-2"
          }
        }
      }
    }
  }
}
```

3. If the only block storage node in your topology is the controller, add the information from step 2 to the Chef environment for your cloud.
4. If you have multiple block storage nodes, or the controller is not acting as the block storage node, add the information from step 2 to the node attributes file for the block storage node.

Deploying with block storage (Cinder) nodes:

Deploy the components that are necessary to create a cloud environment with extra block storage (Cinder) nodes.

About this task

One or more nodes in your cloud topology can be configured as block storage nodes. The controller node is automatically configured as a block storage node. You can define more nodes by using the `ibm-os-block-storage-node` role. A block storage node runs the Cinder volume and Ceilometer compute services; it does not run other controller or compute node services.

A block storage node must meet the following requirements:
- Operating System: Red Hat Enterprise Linux 6.4 or 6.5
- Architecture: x86_64 or ppc64

For more information about storage (Cinder) drivers and the compute node hypervisors that they support, see "Configuring Cinder drivers" on page 129.

When you define your cloud topology, you must define attributes for each block storage node. For example, when you configure the block storage nodes to use the LVM iSCSI driver, you define the iSCSI IP address for each node. Depending on how you want to allocate volumes across the block storage nodes, you might want to define a unique volume backend name for each node.

The general process for including block storage nodes in your cloud topology is as follows:
- Define a `controller +n compute` or `distributed database` topology. Refer to other articles in "Deploying a test or production cloud" on page 77 for instructions to create a topology for your hypervisor.
- Define one or more nodes in your topology as block storage nodes and define the node-specific block storage attributes for each block storage node.
- Deploy your topology.

Use the following instructions to define block storage nodes in your topology.

Procedure

1. Ensure that your environment overrides **`openstack.endpoints.db.host`** with the IP address of the database server (your controller or distributed database server).
2. Create node attribute files for each block storage node. The files include the volume driver-specific attributes for the volume driver that is being used.

   Example node attributes file, `storage-node-1-attributes.json`. It uses the LVM volume driver with its default volume group name, **`cinder-volumes`**.

```
{
  "openstack" : {
    "block-storage" : {
      "volume" : {
        "create_volume_group" : true,
        "create_volume_group_type" : "file",
        "iscsi_ip_address" : "x.x.x.x",
        "multi_backend" : {
          "lvm-1" : {
            "volume_driver" : "cinder.volume.drivers.lvm.LVMISCSIDriver",
            "volume_backend_name" : "lvm-1"
          }
        }
      }
    }
  }
}
```

3. Edit your topology file, `my-topology.json`, and add nodes for the block storage nodes. The **`run_order_number`** for the block storage nodes must be greater than that of the controller node and the distributed database node (if present). The run list for the node must be the single role **`ibm-os-block-storage-node`**. Identify the **`attribute_file`** you created for each node.

```
{
  "name": "CHANGEME",
  "environment": "CHANGEME",
  "secret_file":"/opt/ibm/cmwo/chef-repo/data_bags/example_data_bag_secret",
  "nodes": [
    {
      "fqdn": "controller.private.cloud",
      . . .
    },
    {
      "fqdn": "storage-node-1.private.cloud",
      "password": "CHANGEME",
      "run_order_number": 3,
      "quit_on_error": true,
      "runlist": [
         "role[ibm-os-block-storage-node]"
      ],
      "chef_client_options": "",
      "user": "root",
      "attribute_file": "storage-node-1-attributes.json"
    },
    {
      "fqdn": "compute-node-1.private.cloud",
      . . .
    }
  ]
}
```

4. Finish deploying the topology as described in the directions for your hypervisor.

Disabling Neutron and enabling Nova network

OpenStack provides the following networking services: Nova and Neutron.

About this task

In the default environments that are provided by IBM Cloud Manager with OpenStack, the Neutron network service is configured as the preferred network service.

Important: Due to a number of limitations, it is not recommended to enable the Nova network. For example, the only supported hypervisor type is KVM. Also, the direction of the OpenStack community is to use the Neutron network.

The following information describes details about supported options.

Table 53. Summary of support details

Support options	Details
Supported hypervisor types?	KVM and QEMU
Support for post-deployment customization?	No
Supported topologies?	All, except `Stand-alone self-service portal`

If the Nova network is required, complete the normal deployment steps. You must create the `your-environment-name.json` file using the example environments that are provided. Then, update your environment as normal, and make the following extra changes. All attributes are in the `override_attributes` section of the environment file.

Procedure

1. Change the **`openstack.compute.network.service_type`** attribute to *nova*.
2. (Optional) Update the **`openstack.compute.network.network_manager`** attribute to the applicable network type. Possible values include:
   - *nova.network.manager.FlatManager*
   - *nova.network.manager.FlatDHCPManager* (Default value)
   - *nova.network.manager.VlanManager*
3. Disable IPv6. Nova network support for IPv6 is limited. It is easiest to disable IPv6 in the environment. Find the **`use_ipv6`** setting in the environment and set it to *False*. For example, **`use_ipv6=false`**. The JSON property containing *use_ipv6* varies depending on the environment version.
4. By default, Chef automatically creates a public and a private Nova network with the following settings:

   ```
   {
       'label' => 'public',
       'ipv4_cidr' => '192.168.100.0/24',
       'bridge' => 'br100',
       'bridge_dev' => 'eth2',
       'dns1' => '8.8.8.8',
       'dns2' => '8.8.4.4''
     },

     {
       'label' => 'private',
       'ipv4_cidr' => '192.168.200.0/24',
       'bridge' => 'br200',
       'bridge_dev' => 'eth3',
       'dns1' => '8.8.8.8',
       'dns2' => '8.8.4.4',
     }
   ```

   If you do not want these networks, the **`openstack.compute.networks`** attribute can be specified to either disable the creation of the prior networks or to specify what network should be automatically created.
5. If the `single-controller-n-compute` environment is being used, two more changes must be done because the Nova network running on the compute node must access the Nova database that is defined on the controller.
   - Change the following JSON attribute in your environment file, `your-environment-name.json`:
     – **`openstack.endpoints.db.host`**: Change from *127.0.0.1* to the IP address of the controller node system.
   - The database client role must be added to each of the compute nodes. Modify the run list for each compute node in your topology file, `your-topology-name.json`. Then, add the following client role:

```
'role[ibm-os-database-client-node]'
```

6. To finish the customization, return to the relevant topology deployment process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Disabling the self-service portal

If you want to disable the self-service portal which is used to manage IBM Cloud Manager with OpenStack, you must manually exclude the self-service portal in a topology.

About this task

After you disable the self-service portal, only the IBM Cloud Manager with OpenStack dashboard is available. When the self-service portal is enabled, you can manage IBM Cloud Manager with OpenStack using the dashboard and the self-service portal.

The following information describes details about supported options.

Table 54. Summary of support details

Support options	Details
Supported hypervisor types?	All
Support for post-deployment customization?	No. For disabling and uninstalling the self-service portal post-deployment, see "Uninstalling the self-service portal on Linux" on page 42
Supported topologies?	All, except `Stand-alone self-service portal`

To exclude the self-service portal in the topology, complete the following steps.

Procedure

1. Update the following JSON attribute, which is in the `override_attributes` section of your environment file, `your-environment-name.json`.
   - **`ibm-sce.service.enabled`**: *false*.
2. Remove the **`ibm-sce-node`** role in your topology file, `your-topology-name.json`.
   - Remove **`"role[ibm-sce-node]"`** (including the comma immediately following) in the **`run_list`** for the node. For example, in a **Minimal** topology file, you would remove the *ibm-sce-node* role, as shown.

```
"runlist":[
   "role[ibm-os-allinone-kvm]"
 ]
```

3. To finish the customization, return to the relevant topology deployment process and complete the remaining steps.

Related tasks:

"Deploying a test or production cloud" on page 77
Deploy the components that are necessary to create a test or production cloud environment with more than one node. Use the instructions that apply to your specific hypervisor for each compute node.

Related reference:

"Managing clouds" on page 234
You can add, configure, edit, and remove clouds.

"Roles" on page 287
The following roles are provided in support of the reference topologies.

Verifying Open vSwitch configuration

Verify the Open vSwitch configuration for the applicable network that you configured.

Procedure

1. If you configured a GRE network, verify that there is at least one port beginning with `"gre-"` created on the *br-tun* bridge. Also, verify that the local and remote IP addresses that are listed in the options field match the IP addresses of the controller and the compute node.

```
> ovs-vsctl show

    Bridge br-tun
        Port br-tun
            Interface br-tun
                type: internal
        Port "gre-2"
            Interface "gre-2"
                type: gre
                options: {in_key=flow, local_ip="192.168.0.1",
out_key=flow, remote_ip="192.168.0.2"}
        Port patch-int
            Interface patch-int
                type: patch
                options: {peer=patch-tun}
```

2. If you configured a flat or VLAN network, verify you see the following output:
   a. Verify that a bridge was created matching the name that you specified in the **`openstack.network.openvswitch.bridge_mappings`** property. Typically the bridge is called *br-ethX*.
   b. Verify that port *ethX* was added to bridge *br-ethX* as an interface.
   c. Verify that port *phy-br-ethX* was added to bridge *br-ethX* as an interface.
   d. Verify that port *int-br-ethX* was added to bridge *br-int* as an interface.

```
> ovs-vsctl show

    Bridge br-int
        Port br-int
            Interface br-int
                type: internal
        Port "int-br-eth1"
            Interface "int-br-eth1"
    Bridge "br-eth1"
        Port "br-eth1"
            Interface "br-eth1"
                type: internal
        Port "eth1"
            Interface "eth1"
        Port "phy-br-eth1"
            Interface "phy-br-eth1"
```

   Note: The previous example was truncated to display only what you must verify. If you do not see *″phy-br-ethX′* and *′int-br-ethX′* ports in the `ovs-vsctl` show output (c and d from the previous list), verify that **`neutron-openvswitch-agent`** is active (**`service neutron-openvswitch-agent status`**) and check the error log in `/var/log/neutron/openvswitch-agent.log`.

3. If you configured a VXLAN network, verify that you see the following output.
   - Verify that there is at least one port beginning with *vxlan-* created on the `br-tun` bridge.
   - Verify that the local and remote IP addresses that are listed in the options field match the IP addresses of the controller and the compute node.

```
> ovs-vsctl show

    Bridge br-tun
        Port patch-int
            Interface patch-int
                type: patch
                options: {peer=patch-tun}

        Port br-tun
            Interface br-tun
                type: internal

        Port "vxlan-0a0b010b"
            Interface "vxlan-0a0b010b"
                type: vxlan
                options: {df_default="true", in_key=flow, local_ip="x.x.x.x", out_key=flow, remote_ip="y.y.y.y"}
```

4. By default, the L3 agent and IP movement is enabled. Unless you disabled them, verify that you can see the following output. Specifically, you must verify that the port *ethX* was added to the external network bridge (default is *br-ex*).

```
> ovs-vsctl show

    Bridge br-ex
        Port br-ex
            Interface br-ex
                type: internal
        Port "eth2"
            Interface "eth2"
```

Using your cloud environment

Now that you deployed the components necessary to create your cloud environment, you are ready to start using it.

About this task

For information on managing your cloud environment, see Chapter 7, “Managing IBM Cloud Manager with OpenStack as an Administrator,” on page 207 and if you have the self-service portal enabled, see Managing with IBM Cloud Manager with OpenStack self-service portal (User access).

After deployment, you can further configure some of the IBM Cloud Manager with OpenStack services in your cloud environment. For example, you might need to create your initial networks. For information on configuring your cloud environment, see Chapter 6, “Configuring IBM Cloud Manager with OpenStack,” on page 155.

Adding the self-service portal to a deployed topology

IBM Cloud Manager with OpenStack features an easy to use self-service portal for performing cloud operations. Deploying a cloud environment with the self-service portal is optional. After you deploy your cloud environment, you can add the self-service portal.

About this task

Use the following procedure to add the self-service portal to a deployed topology.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.

2. Update the following JSON attribute in your environment file `your-environment-name.json`. If you have a multi-region cloud environment, then you must update the attribute in the environment file for each region.

   `ibm-sce.service.enabled`: *true*

   This attribute configures the self-service portal for use with OpenStack.

3. Choose a node in your environment on which to deploy the self-service portal. Typically, the self-service portal is co-located with the single controller node or is installed on a stand-alone node. Append the `ibm-sce-node` role to this node in your topology file `your-topology-name.json`. If you have a multi-region cloud environment, only one self-service portal is installed to manage the multiple regions.

   For example, in a minimal topology file, you would append `role[ibm-sce-node]` to the run list for the node:

```
"runlist":[
  "role[ibm-os-allinone-kvm]",
  "role[ibm-sce-node]"
]
```

4. Update your cloud environment to add the self-service portal. If you have a multi-region cloud environment, then you must complete these steps for each region, starting with the region that contains the shared OpenStack Keystone server.

   a. Upload the updated environment file.

```
$ knife environment from file your-environment-name.json
```

   b. Update the topology.

```
$ knife os manage update topology your-topology-name.json
```

   Note: When you enable the self-service portal for IBM Cloud Manager with OpenStack, the following configuration changes are made:

   - Modified OpenStack policy files are installed instead of the default OpenStack policy files. The policy files that are modified for the self-service portal ensure that the user role security model is consistent between what the self-service portal allows and OpenStack. For more information, see Overview of project membership roles.
   - Self-service portal users, roles and projects are pushed into the OpenStack Keystone identity service. For more information, see Project management with OpenStack and “User management with OpenStack” on page 250.
   - The OpenStack cloud connection is configured in the self-service portal.

5. After the update is complete, the IBM Cloud Manager with OpenStack self-service portal is available at `https://`*`node.fqdn.com`*`:18443/cloud/web/login.html`, where *node.fqdn.com* is the fully qualified domain name for the node on which you deployed the self-service portal. You can log in using your current cloud administrator (admin) user.

6. If you have a multi-region cloud environment, you can add an OpenStack cloud connection for the additional regions. For more information, see “Adding an OpenStack cloud configuration” on page 234.

Results

Your existing cloud resources are synchronized with the self-service portal and you can start to use the self-service portal. For more information about the self-service portal, see “Managing with the IBM Cloud Manager with OpenStack self-service portal (Administrator access)” on page 211.

Adding a compute node to a deployed topology

After deploying your topology, you can add a compute node system to your deployment. This does not apply to the Minimal topology.

Before you begin

Before you begin, ensure you completed the Deploying prerequisites steps based on the type of your new compute node.

About this task

Use the following procedure to add a Linux Kernel-based Virtual Machine (KVM) or QEMU, PowerKVM or z/VM compute node to your deployment. To add another Hyper-V compute node, see “Installing and uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent” on page 28.

Note: This procedure is only applicable for adding a new node. It is not meant for deploying to an existing node in your topology.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Create a node specific attribute file. This step is only required when the new compute node requires different attributes from those defined in the environment for the topology. For more information on node specific attribute files, see the applicable “Deploying a test or production cloud” on page 77 section for your compute node type.
3. Deploy the new compute node. Change the following in the command below.
   - **`node-fqdn`**: Set to the fully qualified domain name of the node system. You can also set to the public IP address, private IP address, or hostname.
   - **`node-run-list`**: Set the node run list to be the same as the run list for an existing compute node in the topology. You can look in the topology JSON file to see the run list for an existing compute node. For example, if the run list is **`"runlist": ["role[ibm-os-compute-node-kvm]","role[ibm-os-prs-compute-node]"]`**, then set **`node-run-list`** to *'role[ibm-os-compute-node-kvm],role[ibm-os-prs-compute-node]'*.
   - **`node-ssh-password`**: SSH root user password for the node. To use an SSH identity file instead of a password, use the `-i node-ssh-identity` option, where **`node-ssh-identity`** is the SSH identity file for the node.
   - **`node-attribute-file`**: Set to the node specific attribute file created in step 2. Remove this option if not required.
   - **`topology-file`**: Set to the fully qualified path and file name of the topology JSON file used to deploy the other nodes in the topology. The command updates the topology file with the added compute node information.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   knife os manage deploy node node-fqdn 'node-run-list' -P node-ssh-password --attribute-file
   node-attribute-file --topology-file topology-file
   ```

   For example, *knife os manage deploy node hostname.my.company.com 'role[ibm-os-compute-node-kvm],role[ibm-os-prs-compute-node]' -P passw0rd --attribute-file /root/clouds/hostname_attributes.json --topology-file /root/clouds/my_topology.json*

   Note: For more information on the **`knife os manage deploy node`** command and the topology file, see “Commands” on page 267.
4. After the deployment completes, you can check the status of the IBM Cloud Manager with OpenStack services, see “Checking status of OpenStack services” on page 207.

Results

You are ready to start using IBM Cloud Manager with OpenStack services on the new compute node system.

Related tasks:

"Deploying a remote node fails" on page 306
You attempt to deploy a remote compute node but the deployment fails.

Removing a compute node from a deployed topology

After you deploy your topology, you can remove a compute node system from your deployment. This does not apply to the `Minimal` topology.

About this task

The **`knife os manage remove node`** command attempts to stop and disable any running OpenStack services on the compute node. It then removes the compute node from the cluster on the controller node, and also removes the chef '`node`' and '`client`' objects for the node from the Chef server.

Use the following procedure to remove a Linux Kernel-based Virtual Machine (KVM), QEMU or PowerKVM compute node from your deployment.

Procedure

1. Log in to the deployment system as the *root* user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Remove the compute node. Change the following command parameters.
   - **`node-fqdn`**: Set to the fully qualified domain name of the node system.
   - **`node-ssh-password`**: SSH root user password for the node. To use an SSH identity file instead of a password, use the `-i node-ssh-identity` option, where *node-ssh-identity* is the SSH identity file for the node.
   - **`topology-file`**: Set to the topology file used for deployment. Specifying the **`topology-file`** is optional. If specified, the command removes the compute node information from the **`topology-file`**.
   - **`topology-secret-file`**: Set to the secret file used for deployment. If the **`topology-file`** is specified, then specifying the **`topology-secret-file`** is optional.

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   knife os manage remove node node-fqdn -P node-ssh-password -–topology-file topology-file
   --secret-file topology-secret-file
   ```

   The compute node is now removed from the deployed topology environment. See "Redeploying a node cleanup" on page 148 to clean up the removed compute node.

Changing passwords and secrets

You can change the passwords and secrets that were used during the deployment process.

About this task

This task applies to the **Controller +*n* compute or Distributed database** topologies. Customizing passwords and secrets is not done for the **Minimal** topology.

Note: This procedure only applies to passwords and secrets that are found in the "Data bags" on page 277 topic.

Procedure

1. Change the passwords using the appropriate management interface. From the previous list of data bags, this step is only required for PowerVC and z/VM.
   - For a PowerVC instance:
     - **pvcadmin**: Password for the PowerVC *admin* user. You need to use the proper PowerVC management interface to change it.
     - **pvcqpid**: Password for the PowerVC Qpid *powervc_qpid* user. You must not change this password.
     - **pvcrabbit**: Password for the PowerVC RabbitMQ *powervcdriver_mq* user. This password can be changed with following command on a PowerVC instance.

       Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

       ```
       su - rabbitmq -c '/usr/lib/rabbitmq/bin/rabbitmqctl change_password <powervcdriver_mq user>
       <powervcdriver_mq password>'
       ```
   - For a z/VM instance:
     - **xcat**: Password for the z/VM xcat *admin* user.
     - **xcatmnadmin**: Password for the z/VM *xcat mnadmin* user.
     - **zlinuxroot**: Password for the instances that are created by z/VM root user.
2. You need to refresh your topology deployment to apply the password changes. You also change the secrets as part of this step.
   a. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.

   b. Change to the directory where you stored the files for the topology that you deployed. Change **your-deployment-name** to the name for your deployment.

   ```
   $ cd your-deployment-name
   ```

   c. Download and decrypt the data bags that contain the passwords and secrets for your deployment and store them in the data_bags directory. The data_bags directory contains a subdirectory for each data bag that is used by your deployment. The subdirectories contain the data bag items for your deployment.

   ```
   $ knife os manage get passwords --topology-file your-topology-name.json data_bags
   ```

   d. Change the passwords and secrets in the data bag items for your deployment. The password changes must be based on any prior changes. To change the password, you must change the value of the data bag item name. For example, for the admin.json data bag item, change the value at *CHANGEME* to the password.

   ```
   {
     "id": "admin",
     "admin": "CHANGEME"
   }
   ```

   e. Upload the changed data bags for your deployment.

   ```
   $ knife os manage update passwords --topology-file your-topology-name.json data_bags
   ```

   f. Refresh the topology deployment with the changed passwords and secrets.

   ```
   $ knife os manage update topology your-topology-name.json
   ```

Redeploying a node cleanup

If you need to deploy a topology to a node where a topology has previously been deployed, ensure that the node is in a clean state and that any corresponding node data on the deployment server has been removed.

About this task

Before you redeploy a topology, complete the following steps to prepare your node and deployment server.

Procedure

1. Revert your node system where a topology was previously deployed to a snapshot or backup version of the node. The node must be in the state that it was in prior to when the topology was first deployed.
2. On the deployment server, you must delete the data that is stored about a previously deployed node. The deployment server maintains state and other data about a node system in the deployment server database. If you are redeploying, or if you replace a node with the same fully qualified domain name, run the following commands on the deployment server to remove the data that has been stored about the node:

   ```
   $ knife node delete node.fqdn -y
   $ knife client delete node.fqdn -y
   ```

   These commands reset the node to a clean state for the Chef server.
3. Depending on how your node is configured, you might also need to delete the SSH fingerprint on your deployment server. The deployment knife commands use SSH to communicate with the node system to deploy OpenStack. Use one of the following methods to delete SSH fingerprints from the `.ssh/known_hosts` file on the deployment server:
   - Run the following command:

     ```
     ssh-keygen -R node fqdn
     ```
   - Edit the `.ssh/known_hosts` file in a text editor and delete the line that contains your node system.

Updating a deployed topology

After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

About this task

In addition, you might need to modify the IBM Cloud Manager with OpenStack configuration files or other customizations for your topology.

Note: If you have a multi-region cloud deployment, you need to update each region separately.

To update a deployed topology, complete the following steps:

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Locate the directory that contains the files for the topology that you deployed. Change **your-deployment-name** to the name for your deployment.

   ```
   $ cd your-deployment-name
   ```
3. Download the current environment for your deployment. Change **your-environment-name** to the name for your deployment. The name of your environment can be found in the topology file for your deployment.

   ```
   $ knife environment show your-environment-name -d -Fjson > your-environment-name.json
   ```

4. (This step is only required when you apply fixes as part of the update.) The environment file for your deployment has constraints on the cookbook versions used. These constraints must be updated to use the new cookbook versions. The **knife os manage update environment** command can be used to update the cookbook version constraints.

   - To update a JSON environment file that is named `your-environment.json`, run the following command:

     ```
     knife os manage update environment your-environment.json
     ```

     The file name must end with the `.json` extension. If the file refers to an existing chef environment, the file is uploaded to the chef server.

   A fix pack might also require other changes to the environment. Refer to the instructions in the IBM Cloud Manager with OpenStack fix pack.

5. Optional: You can change the configuration of your IBM Cloud Manager with OpenStack cloud environment after you deploy it. For information about the supported configuration changes, see “Deployment customization options” on page 109. Some cloud environments might not support certain customization options. In addition, some customization options are not supported after a topology is deployed.

   When you make configuration changes to your deployment environment, you can either manually modify the environment JSON file that you downloaded in Step 3 on page 149 or you can use the **knife os manage set environment** command to assist you.

   - Option 1: Manually edit your environment JSON file and then upload it after you complete the configuration changes.

     ```
     $ # Edit the environment JSON file, your-environment-name.json.
     $ knife environment from file your-environment-name.json
     ```

   - Option 2: Create an environment YAML configuration file that contains the configuration changes. Use the **knife os manage set environment** command to modify your environment. For information about the environment YAML configuration file that is used by the command, see “Environment YAML Configuration File” on page 276.

     ```
     $ touch your-environment-name-changes.yml
     $ # Add your environment changes to the environment YAML configuration file.
     $ knife os manage set environment –-env-conf your-environment-name-changes.yml –y your-environment
     ```

     Note: Manual modifications to IBM Cloud Manager with OpenStack configuration files that are managed by Chef are overwritten when you update your cloud environment. Configuration files that are managed by Chef have a banner similar to the following example at the beginning of the file:

     ```
     # This file autogenerated by Chef
     # Do not edit, changes will be overwritten
     ```

     If you must manually modify such configuration files, the modification must be redone after the update.

6. Refresh the topology deployment.

   ```
   $ knife os manage update topology your-topology-name.json
   ```

   All of the nodes that are defined in the topology are refreshed. The following topology JSON items, which are required during a topology deployment, are optional during a topology update:

   Topology Keys: environment

   The environment to use with all nodes in the topology. The environment must exist on the Chef server.

   Node Keys: runlist

   The runlist for the node. The runlist is a list of roles and cookbook recipes to be applied to the node. The roles and cookbook recipes must exist on the Chef server.

If the environment, or runlist values are specified in the topology JSON, they are set again for each node in the topology. If the environment is not specified in the topology JSON, it is not set on all nodes. If the runlist is not specified for a particular node in the topology JSON, it is not set on that node.

If there are nodes in the topology that you do not want to refresh, there are two options to prevent them from being updated (while still leaving them in the topology).

- The **knife os manage update topology** command can be run in interactive mode by specifying the `--interactive` command-line option:

  ```
  $ knife os manage update topology your-topology-name.json --interactive
  ```

  When run in interactive mode, and choosing not to update all nodes, the command asks whether to update each node. You can then skip any nodes in the topology that you do not want to refresh.
- If you do not want to refresh a node in the topology, you can set a key in the topology `JSON` file that is used to specify whether to update it.

  Node Keys: allow_update

  A Boolean value, which indicates whether to update the node. Set to true to update the node. Set to false if you do not want to update the node. The default is true.

7. (This step is only required when you apply fixes as part of the update.) After you refresh the topology deployment, restart the IBM Cloud Manager with OpenStack services. For more information, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

Related concepts:

"Applying fixes and updates" on page 39
You can apply fixes and updates for the IBM Cloud Manager with OpenStack product.

Related tasks:

"Restarting IBM Cloud Manager with OpenStack services" on page 208
If you need to restart services for IBM Cloud Manager with OpenStack, use the IBM Cloud Manager with OpenStack services command and specify the `restart` action. You can use the command to restart IBM Cloud Manager with OpenStack services on a specific node or on all nodes in a topology.

Determining the fix level of deployed nodes

During the IBM Cloud Manager with OpenStack topology update process, you might want to know the current fix level of your deployed nodes.

About this task

The IBM Cloud Manager with OpenStack fix level of the nodes in a topology is available as the **ibm-openstack.cmwo_version** node attribute. This attribute is stored in the IBM Cloud Manager with OpenStack Chef server and in a file that is located on each node. The version is updated after successfully running the **knife os manage deploy node / topology** or **knife os manage update node / topology** commands.

To query the IBM Cloud Manager with OpenStack Chef server for the **ibm-openstack.cmwo_version** node attribute, use the **knife search** command. If a deployed node is restored from a backup, the information in the Chef server will be incorrect if the last deployment or update was completed after the backup.

You must use one of the following commands to show the attribute value for a single node, all nodes, and all nodes that use the same environment.

Example

Single node

```
[root@cmwo ~]# knife search node1.mycompany.com -a ibm-openstack.cmwo_version
1 items found

node1.mycompany.com:
  ibm-openstack.cmwo_version: 4.2.0.0
```

All nodes

```
[root@cmwo ~]# knife search "*" -a ibm-openstack.cmwo_version
2 items found

node1.mycompany.com:
  ibm-openstack.cmwo_version: 4.2.0.0

node2.mycompany.com:
  ibm-openstack.cmwo_version: 4.2.0.0
```

All nodes using the *regionOne* environment:

```
[root@cmwo ~]# knife search chef_environment:regionOne -a ibm-openstack.cmwo_version
2 items found

node1.mycompany.com:
  ibm-openstack.cmwo_version: 4.2.0.0

node2.mycompany.com:
  ibm-openstack.cmwo_version: 4.2.0.0
```

The IBM Cloud Manager with OpenStack version that is used by the most recent **knife os manage deploy** or **update** command is stored in the file /etc/cmwo-version:

```
# This file autogenerated by Chef
# Do not edit, changes will be overwritten

version=4.2.0.0
```

A cumulative log of the updates including the date, result, and IBM Cloud Manager with OpenStack version is maintained in the file /etc/cmwo-version.log:

```
2014-08-22 15:28:47 -0500 : Update failed : cmwo_version=4.2.0.0
2014-08-22 15:45:26 -0500 : Update succeeded : cmwo_version=4.2.0.0
```

Adding a region to a deployed topology

After you deploy your topology, you can add a region to your cloud environment to create or expand a multi-region cloud environment.

About this task

Each region is set up as a separate deployment that uses the same OpenStack Keystone server, but uses a different region and possibly a different hypervisor type. Use the following instructions to add a region to your cloud environment.

This example uses a single deployment server to manage all of the regions. However, you can use a separate deployment server for each region. If separate deployment servers are used, they must have the same version of IBM Cloud Manager with OpenStack installed, but are allowed to have different fix pack levels. For more information about updates and release upgrades in these configurations, see “Best practices for maintaining a multi-region cloud or test cloud” on page 41.

To begin, you must prepare the first region as described.

Procedure

1. Log in to the deployment system as the root user. This is the system where IBM Cloud Manager with OpenStack was installed.
2. Collect information about the first region deployed. This region contains the shared OpenStack Keystone server.
   a. Record the values for the following JSON attributes in the first region's topology file: **environment** and **secret_file**.
   b. Record the values for the following JSON attributes in the first region's environment file:
      - **openstack.auth.strategy**
      - **openstack.region**
      - **openstack.endpoints.host**
      - **openstack.db.service_type**
      - **openstack.mq.service_type**
      - **openstack.secrets.* _data_bag**
      - **ibm-sce.service.enabled**
3. If the OpenStack authentication strategy for the first region (**openstack.auth.strategy**) is not set to *uuid*, then you need to update the topology deployment for the first region.
   a. Update the environment file for the first region to set **openstack.auth.strategy** to *uuid*. Then, upload the updated environment file.
      ```
      $ knife environment from file first-region-environment-name.json
      ```
   b. Refresh the topology deployment for the first region.
      ```
      $ knife os manage update topology first-region-topology-name.json
      ```

   Now you are ready to add the new region. Continue with the following steps.
4. Create an environment file for the new region, which is copied from the `example-ibm-os-single-controller-n-compute` example environment.
5. Create a topology file for the new region that is based on the hypervisor type that is used in the region.
6. Update the environment and topology files for the new region to support the multi-region cloud environment.
   a. In the new region's environment file, set **openstack.auth.strategy** to *uuid*.
   b. In the new region's environment file, update **openstack.region** to be a unique name for the new region. The region name must not contain spaces or special characters.
   c. In the new region's environment file, add the **openstack.endpoints.identity-api.host**, **openstack.endpoints.identity-admin.host**, and **openstack.endpoints.identity-internal.host** attributes and set them to the value of the first region's **openstack.endpoints.host** attribute. The other endpoint host attributes (**openstack.endpoints.host**, **openstack.endpoints.bind-host**, **openstack.endpoints.mq.host**, **openstack-endpoings.db.host**, and so on) reference the management IP address for the single controller node of the new region.
   d. In the new region's environment file, set **ibm-sce.service.enabled** to the value of the first region's **ibm-sce.service.enabled** attribute.
   e. Customize the passwords and secrets for the new region. Since each region uses the same OpenStack Keystone server, the data bag items that are related to OpenStack Keystone must have the same passwords in all regions. Other passwords and secrets can be unique for each region. For more information about customizing passwords and secrets, see "Customizing passwords and secrets" on page 114.

      The following passwords and secrets must be the same between the regions. For more information on the data bags that are referenced, see "Data bags" on page 277.
      - Shared passwords and secrets in the **secrets** data bag:
        – **openstack_identity_bootstrap_token**

  - **openstack_simple_token**
- All passwords and secrets in the **service_passwords** data bag are shared.
- Shared passwords and secrets in the **user_passwords** data bag:
  - **admin**
  - **sceagent**

Note: You can use the following command to determine the current passwords and secrets for the first region. The command downloads and decrypts the data bags that contain the passwords and secrets for the first region and stores them in the data_bags directory. The directory also contains a passwords and secrets JSON file, first-region-environment-name_passwords_file.json, that can be used to set the passwords and secrets for the new region. Ensure that you remove the data_bags directory when you are done using it.

```
$ knife os manage get passwords --topology-file first-region-topology-name.json data_bags
```

f. The remaining environment and topology file updates are normal updates for a stand-alone deployment. However, the same database service (see first region's **openstack.db.service_type** attribute) and the same messaging service (see first region's **openstack.mq.service_type** attribute) must be used for each region. In addition, only one self-service portal is supported in a multi-region cloud environment.

7. Upload the environment and deploy the topology for the new region.

```
$ knife environment from file new-region-environment-name.json
$ knife os manage deploy topology new-region-topology-name.json
```

8. (Optional) Check the detailed status of the IBM Cloud Manager with OpenStack services that are deployed.

```
$ knife os manage services status —-topology-file your-topology-name.json
```

   For more information about managing IBM Cloud Manager with OpenStack services, see "Managing IBM Cloud Manager with OpenStack services" on page 207.

9. If the self-service portal is installed in your multi-region cloud environment, you can add an OpenStack cloud connection for the new region. For more information, see "Adding an OpenStack cloud configuration" on page 234.

10. (Self-service portal): If the self-service portal is installed, restart the IaaS gateway service on the node where the shared OpenStack Keystone server is running. Run the **service openstack-iaasgateway restart** command to restart the service. Then, restart the self-service portal service on the node where it is installed. Run the **service sce restart** command to restart the service. After you restart the services, you can add an OpenStack cloud connection for the additional region. For more information, see "Adding an OpenStack cloud configuration" on page 234.

    Note: Only one self-service portal must be installed to manage the multiple regions.

Results

You are ready to start using IBM Cloud Manager with OpenStack services in the new region.

Chapter 6. Configuring IBM Cloud Manager with OpenStack

Use the following information to configure your IBM Cloud Manager with OpenStack deployment.

Configuring IBM Cloud Manager with OpenStack properties

Various configuration tasks for IBM Cloud Manager with OpenStack include changing the configuration of a topology after you deploy it, creating initial networks, and configuring SSH and ICMP. You can also configure live migration for a KVM node with shared storage, install a network time service, and configure multiple storage backends.

Changing IBM Cloud Manager with OpenStack properties

You can change the configuration of the IBM Cloud Manager with OpenStack topology after you deploy it.

About this task

To change the configuration, follow the instructions in "Updating a deployed topology" on page 149.

Note: Manual modifications to IBM Cloud Manager with OpenStack configuration files that are managed by Chef are overwritten when you update your cloud environment. Configuration files that are managed by Chef have a banner similar to the following example at the beginning of the file:

```
# This file autogenerated by Chef
# Do not edit, changes will be overwritten
```

If you must manually modify such configuration files, the modification must be redone after the update.

Creating initial networks

After you deploy the components for creating a cloud environment, you can create several different types of networks.

About this task

The type of network that you must create depends on the type of network connectivity and hypervisor that you are using. For more information, see "Network considerations" on page 16.

Ensure that you understand the components of OpenStack networking before you create your initial networks. For more information, see Networking API, Tenant and provider networks, and Terminology.

The type of network is not specified for a tenant network because the type of network is determined by one of the following OpenStack properties:

- **openstack.network.openvswitch.tenant_network_type**
- **openstack.network.ml2_tenant_network_types**

When you create a network, you can specify the network type when you specify the provider network extension. You must have the administrator role to use the provider network extensions. For more information about provider network extensions, see Provider attributes.

You can create and manage your networks by using any of the following methods:

OpenStack CLI

For details, see Basic networking operations, Advanced Networking operations, and Provider extension API operations.

OpenStack dashboard

You can create a network in either of the following ways:

- To create both a network and a subnet - Log in to the dashboard, select **Project** > **Network** > **Networks**. Then, click **Create Network**. You cannot specify the network provider settings by using this method. For more information, see Create and manage networks and refer to the section entitled, "Create a network."
- To create a network and specify the network provider settings - Log in to the dashboard, select **Admin** > **System Panel** > **Networks**. Then, click **Create Network**. You cannot create a subnet by using this method. You can create the subnet after the network is created. For more information, see Configuring IBM Cloud Manager with OpenStack dashboard and refer to the section entitled "Provider Network Settings."

IBM Cloud Manager with OpenStack web interface

For details, see "Managing network configurations" on page 237.

Example: Creating network using OpenStack CLI (Hyper-V environment)

Review this example that uses OpenStack CLI to create a network for a Hyper-V environment.

It also shows other network management actions.

Note: The steps are provided for example purposes only.

1. Log in to the controller node.
2. Create a Neutron network that is named *mynetwork*.

```
[root@controller ⌂]# neutron net-create mynetwork
```

The network is created.

```
+---------------------------+--------------------------------------+
| Field                     | Value                                |
+---------------------------+--------------------------------------+
| admin_state_up            | True                                 |
| id                        | 2a75441c-9467-43bf-8afb-3b6821cade52 |
| name                      | mynetwork                            |
| provider:network_type     | local                                |
| provider:physical_network |                                      |
| provider:segmentation_id  |                                      |
| router:external           | False                                |
| shared                    | False                                |
| status                    | ACTIVE                               |
| subnets                   |                                      |
| tenant_id                 | 51cc2d2aff6a4e7d812e2ff60ac9a47a     |
+---------------------------+--------------------------------------+
```

3. Create a subnet that is associated with *mynetwork*, and assign its Classless Inter-Domain Routing address.

```
[root@controller ⌂]# neutron subnet-create mynetwork x.x.x.0/24
```

The subnet is created.

```
+------------------+------------------------------------------+
| Field            | Value                                    |
+------------------+------------------------------------------+
| allocation_pools | {"start": "x.x.x.2", "end": "x.x.x.254"} |
| cidr             | x.x.x.0/24                              |
| dns_nameservers  |                                          |
| enable_dhcp      | True                                     |
| gateway_ip       | x.x.x.1                                 |
| host_routes      |                                          |
| id               | edd8c644-2fbd-4bc6-b2c3-9d44061407a0     |
| ip_version       | 4                                        |
| ipv6_address_mode |                                          |
| ipv6_ra_mode      |                                          |
| name              |                                          |
| network_id        | 2a75441c-9467-43bf-8afb-3b6821cade52     |
| tenant_id         | 51cc2d2aff6a4e7d812e2ff60ac9a47a         |
+-------------------+------------------------------------------+
```

4. Update the subnet. For example, you can enable DHCP and assign a new subnet name, such as *mysubnet*.

   ```
   [root@controller ⌂]# neutron subnet-update --enable-dhcp --name mysubnet edd8c644-2fbd-4bc6-b2c3-9d44061407a0
   Updated subnet: edd8c644-2fbd-4bc6-b2c3-9d44061407a0
   ```

5. Delete the subnet.

   ```
   [root@controller ⌂]# neutron subnet-delete mysubnet
   Deleted subnet: mysubnet
   ```

6. Delete the Neutron network.

   ```
   [root@controller ⌂]# neutron net-delete mynetwork
   Deleted network: mynetwork
   ```

Configuring SSH and ICMP access to deployed virtual machines

After you deploy the components for creating a cloud environment, you can configure SSH and ICMP for accessing your virtual machines.

About this task

To configure SSH and ICMP access to your virtual machines by using the OpenStack dashboard, see Configure access and security for instances and refer to the section entitled, "Add a rule to the default security group."

For information about using commands to configure SSH and ICMP to access your virtual machines, see Enable ping and SSH on VMs (security groups). Using these commands result in the following error:

```
Multiple security_group matches found for name 'default', use an ID to be more specific.
```

Each tenant has a security group called `default`. To determine the security group ID, you can take one of the following actions:

- Deploy a virtual machine and look at the Neutron port settings of the IP address that is assigned to that virtual machine. The security group ID is a property of the Neutron port.
- Use the keystone tenant-list to determine the tenant ID and then dump each Neutron security group to determine which one has the matching tenant ID.

After you identify the security group ID, replace `default` with the security group ID when you run the original **`neutron security-group-rule-create`** commands.

OpenStack provides the following default security rules.

Table 55. Default security rules provided by OpenStack

Direction	EtherType	IP protocol	Remote	Description
Ingress	IPv4 or IPv6	Any	default	Allows all inbound network traffic from any virtual machine that is using this security group. Allows virtual machines that are deployed with this security group to receive data from each other. To prevent or limit communication between deployed virtual machines, delete this rule and add a rule that is more restrictive.
Egress	IPv4 or IPv6	Any	• 0.0.0.0/0 (CIDR) for IPv4 • ::/0 (CIDR) for IPv6	Allows all outbound network traffic to be sent to all destinations (0.0.0.0). Does not restrict any outbound network traffic from the virtual machines. If you want to limit outbound traffic from a deployed virtual machine, delete this rule and add a rule that is more restrictive.

Note: As an administrator, you can use OpenStack to create, delete, and update security groups. Then, when you deploy an image you can use either the OpenStack dashboard, or the image configuration support that is provided through the self-service portal, to manage the security groups. For more information about security group management, see the OpenStack documentation and commands:

- http://docs.openstack.org/openstack-ops/content/security_groups.html
- http://docs.openstack.org/cli-reference/content/

Configuring migration for a KVM node with NFS shared storage

You can migrate running instances from one IBM Cloud Manager with OpenStack compute node to another compute node.

Before you begin

The following prerequisites must be true:

- IBM Cloud Manager with OpenStack was deployed using the controller +*n* compute or distributed database topology with two or more KVM compute nodes.
- You must have NFS shared storage configured.

About this task

Complete the following steps to enable migration capabilities with IBM Cloud Manager with OpenStack on KVM over NFS shared storage.

Procedure

1. Change the following JSON attributes in your environment file:
   a. Under **selinux.booleans.virt_use_nfs**, add the following value.
   ```
   "selinux" : {
      "booleans" : {
        "virt_use_nfs" : "on"
     }
   },
   ```
   b. In the default_attributes.openstack.endpoints section, add **compute-vnc-proxy-bind** as shown:
   ```
   "endpoints" : {
            "compute-vnc-proxy-bind" : {
                "bind_interface": "eth0"
            }
   ```

   If the management network interface of the nodes is not *eth0*, change the **bind_interface** attribute to match your network configuration.

   In the override_attributes.openstack.endpoints section, add **compute-vnc-bind** as shown:
   ```
            "compute-vnc-bind" : {
                "bind_interface": false,
                "host" : "0.0.0.0"
            }
   ```

   This configures the libvirt console VNC service to bind to all compute host interfaces, rather than to a compute host-specific IP that is not valid if the virtual machine is migrated to a different compute host. This could be considered a security exposure, so you might want to consider adding fire wall rules to block VNC access over other interfaces. The default configuration enables VNC access only through the *eth0* interface.
2. Change the following node-specific JSON attributes in your topology file for the controller node:
   ```
   "ibm-openstack": {
      "iptables": {
         "custom_rules": "-A FWR -m state --state NEW -m tcp -p tcp --dport 2049 -j
    ACCEPT -m comment --comment \"nfs\"\n-A FWR -m multiport -m state --state NEW -m
    udp -p udp --dports 111,875,32803,32769,892,662,2020,20049 -j
    ACCEPT -m comment --comment \"nfs\""
     }
   },
   ```
3. Update the topology. For instructions, see "Updating a deployed topology" on page 149.
4. Verify the following after the IBM Cloud Manager with OpenStack deployment is completed. Update as needed.
   a. Verify that **virt_use_nfs** Boolean is set to *ON*.
   ```
   # getsebool -a|grep virt_use_nfs
   virt_use_nfs --> on

   Note: If needed, run the following command to set virt_use_nfs Boolean is set to ON:
   # setsebool -P virt_use_nfs=on
   ```
   b. In the /etc/nova/nova.conf path within the controller and compute nodes, verify the following values.
   ```
   live_migration_flag=VIR_MIGRATE_UNDEFINE_SOURCE,VIR_MIGRATE_PEER2PEER,VIR_MIGRATE_LIVE
   ```
   c. Ensure that the UID and GID of user **'nova'** are identical between each of your nodes.
   ```
   # id nova
   uid=162(nova) gid=162(nova) groups=162(nova)
   ```

- To change a node, run the following commands:

  ```
  # usermod -u 103 nova (to change UID to 103)
  # groupmod -g 103 nova (to change GID to 103)
  ```

- Run the following commands to change file ownership:

  ```
  #service nova-api stop
  #service libvirt-bin stop
  #find / -uid 162 -exec chown nova {} \;  (UID 162 is the old nova UID)
  #find / -gid 162 -exec chgrp nova {} \;  (GID 162 is the old nova GID)
  #service nova-api restart
  #service libvirt-bin restart
  ```

5. Configure NFS.
   a. Ensure that the controller and compute nodes are configured with DNS or /etc/hosts. Make sure that all nodes can perform name resolution with each other. You might use the ping command to ping each host from one another.
   b. Ensure that the UID and GID of your Compute user (Nova) are identical among all of your nodes. This ensures that the permissions on the NFS mount work correctly.
   c. Export INSTANCES_PATH (that is /var/lib/nova/instances) from the controller node, and have it readable and writable by the Compute user on compute nodes.
   d. Configure the NFS server at controller node.
      1) Add the following line to the /etc/exports file:

      ```
      INSTANCES_PATH Controller_IP/MASK(rw,sync,fsid=0,no_root_squash)
      ```

      2) Set the subnet mask to the appropriate value to include the IP addresses of all compute nodes. Then, configure and start services:

      ```
      # exportfs –r
      # chkconfig nfs on
      # service nfs restart
      ```

   e. Set the appropriate permissions on your shared directory. Run the following on all nodes.

   ```
   # chmod 775 INSTANCES_PATH
   ```

   f. Configure NFS mounts on compute nodes.
      1) Add the following line to the /etc/fstab file:

      ```
      Controller_IP:/ /INSTANCES_PATH nfs4 defaults 0 0
      ```

      2) Ensure that you can mount the exported directory can be mounted:

      ```
      # mount -av
      ```

      3) Verify that mount was successful:

      ```
      $ df -k
      Filesystem      1K-blocks   Used    Available  Use%  Mounted on
      ...
      Controller_IP:  921515008  101921792  772783104  12%
        /var/lib/nova/instances  ( <-- verify this)
      ```

      4) Verify that the INSTANCES_PATH directory is accessible and writable by the **'nova'** user:

      ```
      # ls -ld INSTANCES_PATH
      drwxrwsr-x. 5 nova nova 4096 Apr 20 18:25 /var/lib/nova/instances/

      # su – nova
      # touch INSTANCES_PATH/test.txt (this file should be successfully created)
      # rm -f INSTANCES_PATH/test.txt (should be successfully removed)
      # exit
      ```

      Note: For more information, see https://help.ubuntu.com/community/SettingUpNFSHowTo
6. Use the Nova live-migration command to migrate the instances:

   ```
   # nova live-migration server host_name
   ```

   The *server* variable can be either the ID of the server or the name. The *host_name* variable is the new compute host as shown in the Nova service-list.

What to do next

After IBM Cloud Manager with OpenStack is deployed and NFS shares a mount, all instances that are created from this point forward can be migrated between compute nodes.

Important:

- You must configure the firewall (IP tables) to allow **libvirt** to communicate between nodes. By default, **libvirt** listens on TCP port 16509, and an ephemeral TCP range 49152 - 49261 is used for the KVM communications. As a quick test, you can shut down the **IPtables** service to eliminate any firewall issues. When you change firewall rules, be careful choosing what ports you open and understand who has access. For information about ports that are used with **libvirt**, see http://libvirt.org/remote.html#Remote_libvirtd_configuration.
- If you change the Nova VNC console configuration and have existing virtual machines, nova updates the existing virtual machines the next time they are started. You must restart the existing virtual machines before attempting live migration.

For more information about migration, see

- Migrate instances
- Configure migrations

Installing a network time service

Consider synchronizing the system clock of the deployment server and node systems with a network time server.

Before you begin

Note: This task is for Windows NTP server setup only. For Red Hat Enterprise Linux NTP server setup, see your Red Hat Enterprise Linux documentation.

About this task

Complete the following steps to install the Network Time Protocol (NTP) service:

1. Access the NTP installation package, `ntp-4.2.6p5-ibm-win32-setup.exe`, in the root directory of the IBM Cloud Manager with OpenStack installation media.
2. Run the `ntp-4.2.6p5-ibm-win32-setup.exe` file to install the NTP service.
3. After the NTP package is installed, specify the NTP server IP address or host name in `C:\ntp\etc\ntp.conf`.

```
# your local system clock, could be used as a backup
# (this is only useful if you need to distribute time no
matter how good or bad it is)

server x.x.x.x

# but it should operate at a high stratum level to let the
```

4. Navigate to **Control Panel** > **System and Security** > **Administative Tools** > **Services**, and start **Network Time Protocol Daemon** service.

For more information about how to synchronize the system clock with an NTP server, see the Network Time Protocol setup documentation ⌂for the platform.

Configuring multiple block storage back ends

When you deploy an IBM Cloud Manager with OpenStack topology, you can also configure multiple block storage back ends on the controller or a block storage node.

Before you begin

To configure multiple block storage back ends, ensure that the latest fix pack is installed.

About this task

You can also use this multiple block storage back ends technique when you configure block storage back ends on multiple servers to use a different **volume_backend_name** for each block storage node. To configure multiple block storage back ends, you can define an **openstack.block-storage.volume.multi_backend** table to configure each back end as part of the cloud environment or node attributes.

To configure multiple block storage back ends in the Chef environment, complete the following steps:

Procedure

1. Record the configuration for the `cinder.conf` properties as described in Configure multiple-storage back ends. The following example shows two storage back ends, lvm_1 and lvm_2:

```
[DEFAULT]
...
enabled_backends = lvm_1, lvm_2
...
[lvm_1]
volume_driver=cinder.volume.drivers.lvm.LVMISCSIDriver
volume_backend_name=lvm-1
volume_group=cinder-volumes-1
[lvm_2]
volume_driver=cinder.volume.drivers.lvm.LVMISCSIDriver
volume_backend_name=lvm-2
volume_group=cinder-volumes-2
```

2. Convert the information from the previous step to a JSON map for the **openstack.block-storage.volume.multi_backend** attribute that has an entry for each back end configuration file section (lvm_1, lvm_2). Each of these JSON entries is a map that contains the property name and value pairs for each property in the section. The example from the previous step would look like the following example:

```
{
  "openstack" : {
    "block-storage" : {
      "volume" : {
        "multi_backend" : {
          "lvm_1" : {
            "volume_driver" : "cinder.volume.drivers.lvm.LVMISCSIDriver",
            "volume_backend_name" : "lvm-1",
            "volume_group" : "cinder-volumes-1"
          },
          "lvm_2": {
             "volume_driver" : "cinder.volume.drivers.lvm.LVMISCSIDriver",
            "volume_backend_name" : "lvm-2",
            "volume_group" : "cinder-volumes-2"
          }
        }
      }
    }
  }
}
```

3. If the only block storage node in your topology is the controller, add the information from step 2 to the Chef environment for your cloud.
4. If you have multiple block storage nodes, or the controller is not acting as the block storage node, add the information from step 2 to the node attributes file for the block storage node.

Configuring IBM Cloud Manager with OpenStack self-service portal properties

You can configure many self-service portal features through a web user interface. However, you can configure all self-service portal features by modifying configuration property files that are in the self-service portal home directory. This section contains information about these configuration property files and the values that you can modify.

The `/.SCE42` directory is the self-service portal home directory and contains all of the self-service portal configuration property files and log files. On Linux platforms, the default location is the `/var/opt/ibm` directory.

The `authentication.properties` file settings are required for the self-service portal to interface with your cloud manager. The other features provide flexibility and convenience.

To configure basic properties and features of the self-service portal, you must modify properties that are defined within the configuration files in the home directory. These configuration files include the following properties:

`authentication.properties`
Specifies the user authentication type to use for the self-service portal.

`database.properties`
Specifies the database type and path.

`email.properties`
Specifies email notification capabilities.

`cloud.properties`
Specifies the common configuration of the self-service portal and the URL for the User Guide documentation.

`deployment.properties`
Specifies properties for configurations of virtual appliances to simplify deployments for cloud users.

`logging.properties`
Specifies self-service portal log file properties.

`networkConfiguration.properties`
Specifies network configurations for deployments.

`billing.properties`
Enables charging for cloud resources upon deployment.

`metering.properties`
Enables metering for cloud resources upon deployment.

`web.properties`
Specifies properties for the user interface configuration.

`server.properties`
Specifies properties for enabling the optional Secure Sockets Layer (SSL) configuration.

Note: If you modify these properties while the self-service portal server is active, you must stop and restart the self-service portal for the new property values to take effect.

Configuring secure shell (SSH) communication

The IBM Cloud Manager with OpenStack self-service portal ships a self-signed certificate for SSL communication between a client machine, such as a web browser, and the IBM Cloud Manager with OpenStack self-service portal node. This certificate is stored in the `<home directory>/.keystore` file.

This self-signed certificate is shipped for testing purposes only. It is not associated with a qualified host and domain name. Additionally, it is self-signed so a security warning is displayed when you access the host using https. To use SSL configuration in production, create a different self-signed or CA issued certificate that is designated specifically for the qualified host. Additionally, the keystore password must be changed or another keystore must be used to contain this certificate with a secure password. The new passwords would then be used in the following `server.properties` file configuration example.

To export a certificate to be used by clients, run the following command from the `.SCE42` directory:

```
"<jre path>/keytool" -export
-v -alias SKC -file SKC.cer -keystore .keystore -storepass password
```

where *password* is the password you specify.

Notes:

- In order for this command to run properly, the `Java/bin` directory must be added to the system `%PATH%` variable.
- **`keytool`** is a key and certificate management utility that is included with Java™ SE 6.0.

After this certificate is imported into a client, the client can communicate with the IBM Cloud Manager with OpenStack self-service portal by using the trusted certificate with no additional user intervention required. If the import is not done, the client, such as a browser, might prompt the user to verify it and confirm that the certificate is trusted. After you confirm that you accept the risk of the certificate, you will be able to use SSL.

Note: When you use Internet Explorer to install a self-signed certificate, ensure that the certificate issuer name exactly matches the domain name of the URL that you are using it for. For example, if the URL is https://*ip_address*/cloud/web/login.html, where *ip_address* is your IP address, the **`CN`** setting must be CN=*ip_address* and the command is as follows:

```
keytool -genkey -dname "CN=ip_address, OU=Cloud, O=IBM, L=RTP, S=NC, C=US" -alias SKC
        -keystore .keystore -keyalg RSA -keysize 1024
```

If you still cannot install the certificate using Internet Explorer, it might be necessary to modify the system date time to synchronize with the IBM Cloud Manager with OpenStack self-service portal time. Also, ensure that you shut down and restart all instances of Internet Explorer after you install the certificate.

SSL is enabled on the server by configuring the `server.properties` file in the self-service portal home directory as follows:

```
# HTTP server port
org.osgi.service.http.port=18080

# Flag to enable/disable HTTP. If it is necessary for the protocol to be only SSL,
# set this flag to false.
org.eclipse.equinox.http.jetty.http.enabled=true

# Flag to enable/disable HTTPS
org.eclipse.equinox.http.jetty.https.enabled=true

# HTTPS port
org.eclipse.equinox.http.jetty.https.port=18443
```

```
# SSL password
org.eclipse.equinox.http.jetty.ssl.password=password

# Keystore password
org.eclipse.equinox.http.jetty.ssl.keypassword=password

# The full path location of the keystore
org.eclipse.equinox.http.jetty.ssl.keystore=home directory/.keystore

# The SSL protocol
org.eclipse.equinox.http.jetty.ssl.protocol=SSL_TLS
```

Note: The **org.eclipse.equinox.http.jetty.ssl.protocol** property is *SSL_TLS* if running on an IBM JRE. The property is *TLS* if running on a Sun or Oracle JRE.

Restart the server after you change the `server.properties` file. With the server running, point your client to `https://system:18443/cloud/api/users` to test it. Depending on whether you imported the certificate from above, you might be prompted to accept the certificate.

Creating a new certificate for your host

You can use the **keytool** tool to create a self-signed certificate for the host you are deploying IBM Cloud Manager with OpenStack self-service portal on or to create a certificate signing request (CSR) to send to a certificate authority (CA) to get a CA-issued certificate that is trusted by clients automatically.

For example, to generate a new keystore with specific customer information, use the following command:

```
keytool -genkey -dname "CN=cloud.ibm.com, OU=Cloud Services, O=IBM, L=RTP, S=NC, C=US"
-alias SKC -keystore .keystore -keyalg RSA -keysize 1024
```

CN Specifies the customers domain.

OU Specifies the organization within the customer's company.

O Specifies the company.

L Specifies the city of the company location.

S Specifies the state where that city resides.

CB Specifies the country.

To generate a certificate signing request from the keystore, run the following command:

```
keytool -certreq -alias SKC -keystore .keystore -file NewCertSignRequest.csr
```

To import the trusted certificate (.cer) file, run this command:

```
keytool -import -trustcacerts -alias SKC -file ./TrustedCertificate.cer -keystore .keystore
```

See the **keytool** documentation for your JRE for instructions. For the IBM JRE, the instructions are available at http://www.ibm.com/developerworks/java/jdk/security/60/secguides/keytoolDocs/keytool.html.

Note: When the CA is not trusted by clients automatically and you are attempting to access the self-service portal using https protocol, an exception is encountered that says the connection is untrusted. You must confirm that the risks are understood and must add an exception to continue. Even with a trusted certificate, when using Internet Explorer, you are likely to run into a similar exception.

Connecting using SSH

To further minimize security risks when connecting using OpenSSH, change the OpenSSH daemon configuration file so that the line containing `Protocol` is changed to 2. Anything less than 2 is more susceptible to attack. The OpenSSH daemon implemented under the IBM Cloud Manager with OpenStack self-service portal uses port 22 as a default for communication.

Configuring user registry authentication

The IBM Cloud Manager with OpenStack self-service portal supports both Local and Lightweight Directory Access Protocol (LDAP) user registry authentication mechanisms. Authentication is performed by using the self-service portal local user registry.

Important: If you deployed the self-service portal as part of a IBM Cloud Manager with OpenStack topology, it is automatically configured to use the Keystone authentication mode. Therefore, this information does not apply. These instructions apply to the stand-alone self-service portal topology only.

Local user registries are intended for small-scale usage, such as proof-of-concept scenarios, demonstrations, or environments with up to 30 users and projects.

LDAP user registries provide the highest level of security and scalability for production environments and enable the self-service portal to share a central user registry for existing users with other applications that support LDAP.

For more information about user registry authentication, see "Supported IBM Cloud Manager with OpenStack user registries" on page 10.

LDAP authentication

The IBM Cloud Manager with OpenStack includes an LDAP authenticator that is designed to authenticate users in a wide range of environments, whether the authentication process is a simple bind or a multistage process.

LDAP authentication is performed by defining a series of steps for the authentication process, defining the inputs and outputs of each step, and then running them in sequence. If all the steps run successfully, the user is authenticated.

Configuring LDAP authentication manually

Beginning in IBM Cloud Manager with OpenStack 3.1 the web interface is the primary means of configuring LDAP. If you have a migrated LDAP configuration from a previous release, or if you want to enable user name case sensitivity, you can edit the `ldap.xml` configuration file.

For more information about configuring LDAP by using the web interface, see "Configuring LDAP authentication using the web interface" on page 212.

Properties of an LDAP authentication step

Host A string host name for the LDAP host. This property is required.

Search Context
If an LDAP lookup is to be performed, a search context must be provided. This property is required only if a search filter is provided.

Search Filter
If an LDAP lookup is to be performed, a search filter format string must be provided. This string tells the authenticator how to create a search filter that ensures that only one result is returned, as LDAP does not guarantee ordering of results if there are more than one. Additionally, the string *FILTER* is a special value in the search filter. This string is replaced with the user ID entered during login. If you do not use the string *FILTER* in your configuration file, there is no replacement during authentication. If the strings that are defined in your configuration file are static, and a search context is provided, the search filter property is required.

Authentication DN

This property specifies the distinguished name (DN) used for authenticating to the LDAP server. If you are using this property to perform a search, you can specify the property as:

```
</authDN password="password">dnname</authDN>
```

If the property is specifying the DN to use for authentication, define the DN in one of the following ways:

- The DN can be constructed from the user ID. For example, the DN for a user logging in as *joe* can be constructed by using the following:

  ```
  <authDN>uid={FILTER},ou=people,dc=site</authDN>
  ```

  This example creates the DN `uid=joe,cn=users,ou=people,dc=site`
- The DN of the LDAP user entry that is returned by a previous search step is represented using the special value {PERSON_DN}, as shown in this example:

  ```
  <authDN>{PERSON_DN}</authDN>
  ```

In both cases, the password that the user entered to log in is also used to authenticate to the LDAP server.

To perform an anonymous search, do not specify the authentication DN property.

Admin Users

This attribute specifies a list of LDAP user accounts to be given administrator privileges:

```
<adminUsers>admin@company.com,me@company.com</adminUsers>
```

User name case sensitive

This attribute specifies whether the LDAP server defines the user name as case sensitive or not.

```
<userNameCaseSensitive>true</userNameCaseSensitive>
```

Secure connection enablement

This attribute specifies whether to enable a secure connection for LDAP authentication. Some LDAP servers enable the **StartTLS** operation by default, and other LDAP server do not. As an administrator, you can turn off the secure connection, if the LDAP server does not support **StartTLS** operation. The possible values for this attribute are **`true`** or **`false`**. To enable a secure connection, specify this property in the config element:

```
<enableSecureConn>true</enableSecureConn>
```

Outputs

This value indicates what information is needed during the current step for the next step and how to pass that information along. The Outputs value is essentially a list of instructions that gets an attribute value, for example *foo*, and passes it along as *bar*. This value is optional.

- **User account name**: An output can be flagged as the name for a user account by adding `attribute="fullname"` to the output tag. This value is retrieved and used as the user name by IBM Cloud Manager with OpenStack. If you do not specify this value, the user ID is used for the user display name.
- **User e-mail address**: An output can be flagged as the email for a user account by adding `attribute="email"` to the output tag. This value is retrieved and used as the user email address by IBM Cloud Manager with OpenStack.

Example of an ldap.xml file

In this example of an `ldap.xml` file, an authenticated secure search is performed to find the directory entry where the mail attribute matches the value that is passed into the username field.

```
<?xml version="1.0"?>
<config>
 <host>ldap://ldap.company.com</host>
  <adminUsers>admin@company.com,me@company.com</adminUsers>
  <enableSecureConn>false</enableSecureConn>
  <userNameCaseSensitive>true</userNameCaseSensitive>
```

```
  <step>
     <authDN password="password">cn=ldapAdmin,ou=directory,o=company.com</authDN>
     <searchFilter>(|(mail={FILTER}))</searchFilter>
     <searchContext>ou=directory,o=company.com</searchContext>
     <outputs>
        <output attribute="fullname">
           <get>cn</get>
        </output>
     </outputs>
   </step>
   <step>
      <authDN>{PERSON_DN}</authDN>
   </step>
</config>
```

Changing authentication mode

You can change the IBM Cloud Manager with OpenStack to LDAP authentication mode by editing the `authentication.properties` file.

About this task

Note: Beginning in IBM Cloud Manager with OpenStack 3.1, the web interface is the primary means of configuring LDAP. If you use the web interface to configure LDAP, the steps in this task are not required. For more information about configuring LDAP by using the web interface, see "Configuring LDAP authentication using the web interface" on page 212.

To change IBM Cloud Manager with OpenStack to LDAP authentication mode, complete the following steps:

Procedure

1. Open the `authentication.properties` file in the home directory.
2. Set the `authentication.type` property to *LDAP* as shown in the following example:
   ```
   authentication.type=LDAP
   ```
3. Open the `ldap.xml` file in the home directory.
4. Configure the LDAP steps as described in the "Configuring LDAP authentication manually" on page 166.
5. Restart the IBM Cloud Manager with OpenStack server.

   You can change the authentication mode back to local by setting the `authentication.type` property back to *LOCAL*.

Configuring local authentication

By default IBM Cloud Manager with OpenStack is set up to use local authentication mode. Local authentication is intended for small-scale usage, such as proof-of-concept scenarios, demonstrations, or environments with up to 30 users and projects. For large-scale production environments, configure LDAP to ensure the highest level of security.

About this task

Validate the configuration by following these steps:

Procedure

1. Open the `authentication.properties` file in the home directory.
2. Configure the `authentication.type` property to use local authentication, such as:
   ```
   authentication.type=Local
   ```
3. Configure the default administrator user name, name, and password, similar to the following example:

```
admin.username=admin
admin.name=SCE Administrator
admin.password=<password>
```

Notes:

a. These fields might already be populated or configured during installation.

b. The values of the `admin.username`, `admin.name`, and `admin.password` that are shown are examples. You should update these values according to your business or security guidelines.

c. To prevent too many invalid login attempts, a user can attempt to login to IBM Cloud Manager with OpenStack three times within a 24-hour period. After three failed login attempts, both the user and administrator roles are locked out. However, the administrator can unlock the user record.

   To configure this limitation, enable the `com.ibm.cfs.failedlogincheck.enabled` property as follows:

   ```
   com.ibm.cfs.failedlogincheck.enabled=false
   ```

   This property is disabled by default.

d. The account 'Locked' field associated with the user record in IBM Cloud Manager with OpenStack, is valid only when the account is locked in IBM Cloud Manager with OpenStack using LOCAL authentication, rather than LDAP authentication. If you are using the LDAP authentication and have the 'account locking' feature enabled on your LDAP server, do not enable it on the IBM Cloud Manager with OpenStack server. In this case, set the `com.ibm.cfs.failedlogincheck.enabled` property to `false` in the `authentication.properties` file on the IBM Cloud Manager with OpenStack server.

Configuring REST API authentication

You can configure IBM Cloud Manager with OpenStack to require authentication when it calls to the IBM Cloud Manager with OpenStack REST APIs.

About this task

IBM Cloud Manager with OpenStack supports the following authentication methods:

- Basic HTTP authentication for a user login and REST API-based validation
- Encrypted token-based authentication for REST API calls

The basic strategy for using encrypted tokens is as follows:

- HTTP/REST agents (browser or REST client) initially use the login authentication REST API to authenticate their user ID and password credentials.
- The user ID and password are validated against the LOCAL or LDAP repository (depending if LOCAL or LDAP is configured).
- Upon successful login authentication, an encrypted token and its expiration are returned in the login response.
- The agent can use (as an HTTP header cookie) the encrypted token for subsequent REST API calls to identity themselves until the token expires.
- After the authentication token expires, the agent must use the login REST API again to validate their user ID and password. When complete, the agent obtains a new authentication token.

Note: The system that is running the IBM Cloud Manager with OpenStack web interface or REST client must have the date, time, and time zone that is correctly configured for its physical location.

To require authentication when IBM Cloud Manager with OpenStack calls to the Rest APIs, complete the following configuration steps:

Procedure

1. Open the `authentication.properties` file in the home directory.
2. Set the authentication.secure property to `true` as shown in the following example:

   ```
   authentication.secure=true
   ```

   When the property is set to `true`, the caller is prompted for credentials before it processes the API request. The credentials are validated against the user registry that is configured, such as Local or LDAP.
3. If IBM Cloud Manager with OpenStack is configured to use Single Sign On with other SmartCloud products, you must set the shared secret key. Use the same shared secret key in all applications by using Single Sign On. If IBM Cloud Manager with OpenStack is not using Single Sign On, leave the property unset and the application generates and save a new secret key when it first starts.

   ```
   com.ibm.cfs.token.key=The Secret Encryption Key
   ```
4. Optional: Set the name of the HTTP header cookie. The cookie is used to transport the encrypted authentication token. This property specifies the name of the HTTP header cookie, which is used in HTTP REST API requests to transport the encrypted authentication token. The default value is *simpletoken*.

   ```
   com.ibm.cfs.token.header.field.name=simpletoken
   ```
5. Optional: Set the time duration for authentication tokens (in seconds). This time duration determines how long an authentication token is valid. After a token expires, the agent must obtain a new token by using the login authentication REST API.

   ```
   com.ibm.cfs.token.duration=14400
   ```
6. Optional: Disable automatic renewal for the authentication token. When enabled, authentication tokens renew (by using the specified duration period) each time they are successfully used on an API call. If this option is disabled, the only way to renew an authentication token is to obtain a new token by using the login authentication REST API.

   ```
   com.ibm.cfs.token.autorenew.enabled=false
   ```
7. Restart your IBM Cloud Manager with OpenStack server for the changes to take effect.

Configuring database

By default, IBM Cloud Manager with OpenStack uses an internal Derby database that is created inside the home directory. For optimal performance in a large environment such as a production environment, consider the use of an external database. IBM Cloud Manager with OpenStack supports the use of an external DB2 database.

About this task

For more information about DB2 support, see "Supported IBM Cloud Manager with OpenStack databases" on page 9.

The self-service portal also supports initial use of a Derby database and migration to a DB2 database at a future point.

To change the self-service portal database configuration to use DB2, complete the following steps:

Procedure

1. Open the `database.properties` file in the home directory.
2. Set the database.type property to DB2, as shown in the following example:

   ```
   database.type=db2
   ```
3. Set the database.username property to the user ID defined for the database, as shown in the following example:

   ```
   database.username=<db2user>
   ```

4. Set the database.password property to the password ID defined for the database, as shown in the following example:

   ```
   database.password=<db2passwd>
   ```

   Note: The clear text password is replaced with an encrypted password after the self-service portal starts the first time.
5. Set the database.db2.path property to the location of the DB2 database, as shown in the following example:

   ```
   database.db2.path=//localhost:50000/cfs:
   ```

   Note:
   - One or more connection directives can be appended to the database path, and they must be separated by a semicolon. For example:

     ```
     database.db2.path=//localhost:50000/cfs:retrieveMessagesFromServerOnGetMessage=true;
     ```
   - Replace `localhost` with a full IP address (it can be a remote host) and verify the port number. Here are a few links to help you find the port number:

     UNIX: http://publib.boulder.ibm.com/infocenter/cmgmt/v8r3m0/index.jsp?topic=%2Fcom.ibm.sysadmin.hlp%2Fcsa10010.htm or as a potential shortcut, use the `grep i db2 /etc/services` command.

     Windows: http://publib.boulder.ibm.com/infocenter/cmgmt/v8r3m0/index.jsp?topic=%2Fcom.ibm.sysadmin.hlp%2Fcsa10010.htm or as a potential shortcut, look for the DB2 entries in the services file at `C:\WINDOWS\system32\drivers\etc\services`.

Configuring email notifications

To receive email notifications when various actions are taken, you must configure the notification properties in the home directory.

About this task

The following examples are user and administrator events that can be configured to trigger an email notification.

- Account is created or deleted, reaches its balance threshold, is delinquent, receives a payment, has a bill created
- Instances are deployed, fail, expire, have snapshots complete
- Project access is requested or granted
- User is created, requests access, has a password reset
- Virtual machine is backed up, restored, has a snapshot created, or reverts to a snapshot
- Volumes are created, deleted, detached and resized

To set up notification for the IBM Cloud Manager with OpenStack self-service portal, follow these steps:

Procedure

1. Open the `email.properties` file in the home directory.
2. Set the `com.ibm.cfs.email.relay.host` property to the host name of the relay host that the self-service portal uses for outgoing SMTP emails.
3. Optionally, you can set the email subject prefix for all self-service portal emails and the "from" name, by setting the following properties:

   ```
   com.ibm.cfs.email.subject.prefix
   com.ibm.cfs.email.from.name
   com.ibm.cfs.email.from.address
   ```
4. Save the `email.properties` file and restart the self-service portal service.

You can globally disable email notifications in the self-service portal by setting the `com.ibm.cfs.email.default.notifications` property in the `email.properties` file to `false`. Individual users can disable notifications through the self-service portal.

Note: Ensure that the self-service portal administrator has an email address that is configured to receive notifications. The notifications email for volume operations can be sent only to the self-service portal Administrator.

Configuring common cloud properties

Common cloud properties are configured by providing information such as the refresh interval and online help configuration in the `cloud.properties` file.

About this task

To configure your cloud manager, complete the following steps:

Procedure

1. Open the `cloud.properties` file in the home directory.
2. Edit the properties by providing values for each configuration property.
3. Save the `cloud.properties` file and restart the IBM Cloud Manager with OpenStack self-service portal server.

Cloud refresh interval

IBM Cloud Manager with OpenStack checks for new images and instances in the cloud and synchronizes the properties for these images and instances.

By default, IBM Cloud Manager with OpenStack receives messages from the cloud to synchronize with the cloud manager. The frequency of this synchronization is determined by the `com.ibm.cfs.cloud.refresh.interval` property in the `cloud.properties` file. If the property is not set, a default of 30 seconds is used.

IBM Cloud Manager with OpenStack scans the cloud for updates on instances as often as the refresh interval property specifies. However, you can change the synchronization mode so that IBM Cloud Manager with OpenStack periodically checks with the cloud without waiting for messages.

For more information about setting the synchronization mode, see “Configuring cloud synchronization mode” on page 174.

Cloud online help configuration

The IBM Cloud Manager with OpenStack has a configurable documentation property that enables IBM Cloud Manager with OpenStack to open the User Guide when the Help link is selected by the user.

About this task

To configure the URL for the Help documentation, follow these steps:

Procedure

1. Open the `cloud.properties` file in the home directory.
2. Configure the property `com.ibm.cfs.cloud.documentation` to be set to the URL for the User Guide location. By default, this property is set to the IBM Cloud Manager with OpenStack User Guide. Using the default property setting, the user can access the User Guide on the IBM Cloud Manager with OpenStack wiki in any of the supported languages by selecting the link for the language of choice. If something other than this default behavior is wanted, the property can be changed to any URL where the User Guide document is located.

Configuring global image deployment

Image deployment customization properties that apply equally to all images in the IBM Cloud Manager with OpenStack self-service portal image library can be configured through the `deployment.properties` configuration file in the home directory.

To simplify the image deployment process for self-service portal users, configure all of the images before you make the self-service portal available to users. Image property customization often requires knowing the low-level details of the environment or having advanced knowledge of the data center.

You can configure image deployment customization properties through the self-service portal for individual image settings or through the `deployment.properties` file in the home directory for global image settings. For more information about configuring individual image settings, see "Configuring image deployment properties" on page 219.

The contents of the `deployment.properties` configuration file depend on what is expected by the cloud manager software, either VMware or OpenStack and what hardware is available.

Note: Global configurations are refreshed only when manually reset or when the deployment target changes.

VMware

When you use VMware as the cloud manager, the following properties are supported for Linux and Windows images:

```
vmware.linux.dns1=9.8.8.8
vmware.linux.dns2=9.8.8.7
vmware.linux.hostname=myhost
vmware.linux.domainname=cloud.company.com

vmware.windows.computername=WINDOWS
vmware.windows.workgroup=WORKGROUP
vmware.windows.timezone=20
vmware.windows.username=John Doe
vmware.windows.organization=Cloud Company
vmware.windows.productkey=xxxx-xxxx-xxxx-xxxx-xxxx
vmware.windows.password=Default_password_for_windows_deployments

vmware.dnssuffixlist=cloud.company.com,company.com

vmware.networkdevice.Network adapter 1.network=VM Network
vmware.networkdevice.Network adapter 1.usedhcp=false
vmware.networkdevice.Network adapter 1.ipaddress=
vmware.networkdevice.Network adapter 1.netmask=255.255.255.0
vmware.networkdevice.Network adapter 1.gateway1=9.9.9.9
vmware.networkdevice.Network adapter 1.gateway2=
vmware.networkdevice.Network adapter 1.dns1=9.8.8.8
vmware.networkdevice.Network adapter 1.dns2=9.8.8.7
vmware.networkdevice.Network adapter 1.primaryWINS=9.8.8.10
vmware.networkdevice.Network adapter 1.secondaryWINS=9.8.8.11
```

For VMware, you can also find these properties in the `deployment.properties` file.

OpenStack

When you use OpenStack as the cloud manager, the following properties are supported for AIX®, Linux, and Windows images in the `deployment.properties` file:

```
openstack.openstack.flavors
openstack.openstack.keypairs
openstack.openstack.security.groups
openstack.openstack.server.personality.source.[1-5]
openstack.openstack.server.personality.target.[1-5]
openstack.openstack.server.customizations
openstack.networkdevice.Network adapters.networks
openstack.config.drive
```

More deployment properties are available for images that have a configuration strategy. For more information about configuration strategies, see “Configuring images with OpenStack” on page 184.

Configuring a deployment target

By default, IBM Cloud Manager with OpenStack deploys images to any known pool or host in the cloud, where "pool" refers to a resource pool when you are using VMware. OpenStack only supports the cloud as the deployment target. For VMware, you can set a different default global deployment target.

About this task

To change this default target selection strategy, follow these steps:

Procedure

1. Open the `deployment.properties` file in the home directory.
2. Set the value of the `com.ibm.cfs.deployments.target.strategy` property to any of the following target selection strategies:

   byName
   Use the target with the given name. The name might refer to a host, system pool, resource pool, or cluster depending on the type of cloud adapter that is being used. Set the property value to `byName:{targetName}`, where `{targetName}` is the actual name of the desired system.

   byID Use the system with the specified ID. Set the property value to `byID:{targetOID}`, where `{targetOID}` is the actual OID of the desired system.

   anyPool
   Use any system that is a pool.

   anyHost
   Use any system that is a physical host.

   anyPoolOrHost
   Use any pool or physical host.

   anyCluster
   Use any cluster (applicable to VMware only).

   anyTarget
   Use any pool or host or cluster for VMware.
3. Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server.

Configuring cloud synchronization mode

IBM Cloud Manager with OpenStack scans the cloud for updates on instances as often as the refresh interval property specifies. However, you can change the synchronization mode so that IBM Cloud Manager with OpenStack periodically checks with the cloud without waiting for messages.

To change the sync mode, open the `deployment.properties` file and modify the following settings:

```
com.ibm.cfs.cloud.sync=push
```

To enable IBM Cloud Manager with OpenStack to synchronize with the cloud by using periodic checking, set this property to `poll`. Enable the configuration by ensuring that you uncomment the **`com.ibm.cfs.cloud.sync`** line (remove any preceding # symbol).

For more information about setting the refresh interval, see “Cloud refresh interval” on page 172.

Configuring a staging project

By default, IBM Cloud Manager with OpenStack scans the cloud for new images periodically. When IBM Cloud Manager with OpenStack finds a new image or instance, it places it in the Public project where all users have access to it. However, you can configure a staging project to store newly discovered images or instances, allowing administrators to configure images before making them available to other users.

For more information about newly discovered images, see Cloud refresh interval.

To configure this staging project, add or uncomment this line in the `deployment.properties` file:

```
com.ibm.cfs.staging.project=Staging
```

Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server. The property takes effect after the server is restarted.

Note: When using the VMware adapter, virtual servers that are defined as templates on the vCenter server are automatically discovered and displayed on the IBM Cloud Manager with OpenStack Images area. The IBM Cloud Manager with OpenStack administrator defines which images belong to which user profiles and therefore defines which VMware virtual server templates a user can access. IBM Cloud Manager with OpenStack discovers all virtual server templates regardless of which datacenter they reside in. There is currently no option to limit IBM Cloud Manager with OpenStack to specific datacenters.

Configuring global priority of an instance when relocating

IBM Cloud Manager with OpenStack enables you to choose whether you want your users to update the global priority of an instance when relocating the instance from host to host. *Instance priority* is the priority for relocating instances from one host to another host, when the instance is deployed in a pool. Depending on your site administration policies, you might not want users to change the priority of instances.

About this task

To configure the ability of updating instance priority, follow these steps:

Procedure

1. Open the `deployment.properties` file in the home directory.
2. To disable the ability to update instance priority, set the `com.ibm.cfs.deployments.update.priority` property to *false*. The default value of this property is *false*. If this property does not exist in the `deployment.properties` file, add it to the file.
3. Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server.

Configuring access to advanced deployment form

IBM Cloud Manager with OpenStack allows you to choose whether you want your users to see the advanced deployment form or just the basic deployment form.

About this task

The advanced deployment form allows a user or administrator to access all of the image properties that can be configured when an image is deployed. The basic deployment form contains only a subset of the image properties. Depending on your site administration policies, you may or may not want to show this advanced panel to the user.

To configure the visibility of the advanced deployment form, follow these steps:

Procedure

1. Open the `deployment.properties` file in the home directory.

2. Set the `deployment.advanced.form.enabled` property to *true*. This value enables the advanced deployment form so that it is displayed to all users. The default value of this property is *false*; users, by default, do not see the advanced deployment form.
3. Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server.

Results

Note: Administrators can also configure which advanced properties are shown on the basic deployment form. Use the web interface to configure those values for an image. When the `deployment.advanced.form.enabled` property is set to *true*, project owners can also configure which advanced properties are shown on the basic deployment form

Configuring the number and maximum size of additional storage

IBM Cloud Manager with OpenStack interface allows a user to add additional secondary disks to a virtual image using the Add Storage property. Adding additional secondary disks is also supported for VMware when you are deploying an image. IBM Cloud Manager with OpenStack provides a configurable property to set the maximum number of disks that can be attached to a virtual machine. This property applies during and after deployment of the virtual machine.

About this task

Note: This feature is not supported if the following statements are true:
- The virtual machine is deployed in the Shared Storage Pool.
- The instance that is being deployed is an IBM i instance.

To configure the secondary disk properties, follow these steps:

Procedure

1. Open the `deployment.properties` file in the home directory.
   - To set the maximum number of disks to use, edit the `com.ibm.cfs.vs.max.disks` property. The default value of this property is `3`.
   - To set the maximum size in megabytes, edit the `com.ibm.cfs.vs.max.disksize` property. The default value of this property is `2048000`.
2. Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server.

Configuring images with VMware

This section describes some additional setup and configuration considerations when using the VMware cloud manager.

VMware considerations when deploying an image:

- IBM Cloud Manager with OpenStack requires the vCenter virtual switches and distributed virtual switch port groups to be defined before deploying instances. IBM Cloud Manager with OpenStack users and administrators are allowed to choose which virtual network the instance uses. IBM Cloud Manager with OpenStack supports either standard VMware vSwitches or distributed virtual switch port groups. IBM Cloud Manager with OpenStack supports the IBM DVS 5000V and the IBM SDN VE distributed virtual switches. If you are using a distributed virtual switch other than those, check the type in vCenter to ensure that it is supported.

  To check the type in vCenter, follow these steps:
  1. Browse to `https://<your vCenter>/mob`.
  2. Log in with an administrator account.
  3. Select the content link.
  4. Select the root folder.
  5. Select the data center that contains the third party distributed virtual switch.

6. Select the network folder.
7. Select the distributed switch that you want (the id starts with **dvs-**).

The top of the page shows the managed object type of the switch. If the switch type is *VmwareDistributedVirtualSwitch* or *DistributedVirtualSwitch* then it is supported. If the distributed switch type is something other than the types listed, it is not supported; you receive an error when you deploy to a port group that uses that distributed switch.

- IBM Cloud Manager with OpenStack connects to the vCenter server by using a single user ID and password. It is recommended that this user has the vCenter administrator role. If you choose to use a different user ID, that user must have sufficient permissions to perform the operations on the virtual machines. The user ID must also have access to various virtual machine resources, such as networks and datastores.
- Do not change a virtual machines UUID in the vSphere Infrastructure Client. In some cases, such as manually moving a virtual machine, the vSphere Infrastructure Client asks if you want the UUID changed. When an instance is deployed, IBM Cloud Manager with OpenStack keeps the UUID of the virtual machine in its database and uses that UUID to find the virtual machine in vCenter, therefore you should not change the UUID.
- At some point, you might decide to migrate from IBM Cloud Manager with OpenStack to the IBM Tivoli Service Automation Manager (TSAM) product or other IBM cloud product. To ease the transition, it is highly recommended that you set up your Windows and Linux guest images as required by TSAM. Even if you have no plans to migrate, see Creating operating system image templates for VMware in the IBM Tivoli Service Automation Manager information center at http://pic.dhe.ibm.com/infocenter/tivihelp/v10r1/topic/com.ibm.tsam_7.2.4.1.doc/rdp/c_supported_os_vmware.html for more information about configuring your guest images.
- It is recommended that you install VMware tools on your guest operating systems before you make the virtual machine a template.

  Note: The VMware tools must be current with your version of VMware.
- If you are using the VMware Converter tool to import your virtual machines into vCenter, you should fully start the virtual server by using the VMware vSphere Client before you make it a template. This action allows vCenter to discover whether VMware tools are installed into the guest.
- All virtual machines in vCenter are shown as instances in IBM Cloud Manager with OpenStack. If you convert a virtual machine to a template, the status of that instance in IBM Cloud Manager with OpenStack changes to Unknown since the virtual machine is now a template. Do not delete this instance from IBM Cloud Manager with OpenStack since that deletes the underlying template on vCenter. If you want to make this instance not available for non-administrative users, use the Hide option instead.
- IBM Cloud Manager with OpenStack does not allow you to import vApps. If you want to enable users to deploy a single virtual server vApp, follow these steps:
  - Import the vApp by using vCenter
  - Modify the vApp properties as required by the application.
  - Convert the vApp to a template
- vApps with more than one virtual server are not supported.
- During the deployment of an image, IBM Cloud Manager with OpenStack uses the VMware API to apply customizations to the new virtual machine image. Therefore the VMware template image must be customizable by VMware. While VMware vCenter enables you to deploy a template without customizations, this option is not available in IBM Cloud Manager with OpenStack.
- When you deploy an image, IBM Cloud Manager with OpenStack instructs VMware to power on the newly deployed virtual machine. In some cases, depending on server loads, VMware might not power on the virtual machine. In this case, IBM Cloud Manager with OpenStack displays, by default, the instance in STOPPED state. Since the instance has been successfully cloned and configured, IBM Cloud

Manager with OpenStack does not display an error and the instance can be started by the user. You can change this default behavior by using a deployment property that is described in the Waiting for a deployed virtual machine (VMware) topic.

- By default, IBM Cloud Manager with OpenStack reports a newly deployed instance in OK state as soon as VMware powers on the virtual machine. Depending on the guest operating system and image definition, it might be a few minutes before the virtual machine is completely up and running and can be used. In some cases, VMware might restart the virtual machine more than once during the customization process. You can change this default behavior by using a deployment property that is described in the Waiting for a deployed virtual machine (VMware) topic.
- IBM Cloud Manager with OpenStack allows the target of a deployment to be either a specific host, a host resource pool that is associated with a host, a cluster, or a resource pool that is associated with a cluster. If the cluster is a DRS enabled cluster, VMware chooses the appropriate host and therefore you cannot choose an individual host in that cluster. By default, IBM Cloud Manager with OpenStack is configured to randomly choose a host that is not associated with a cluster. If no hosts are available, you get an error when you deploy. You can change the default behavior by modifying the `deployment.properties` file as described in section "Configuring a deployment target" on page 174. However, it is recommended that an administrator configure each images target. For more information, see "Configuring global image deployment" on page 173.
- IPv6 is not supported when deploying to a VMware cloud. In order for deployments to not obtain an IPv6 address, the administrator needs to disable IPv6 in the VM template that is used for deploys.

Saving, restoring, and deleting virtual servers:

The IBM Cloud Manager with OpenStack allows users to save back up copies of their virtual server disks and configuration files. These copies can be restored later.

In addition, IBM Cloud Manager with OpenStack provides functions to allow users to view and delete their saved images. IBM Cloud Manager with OpenStack allows users to keep an administrator configured number of saved images. When the limit is reached, the system automatically deletes the oldest saved image. For information about how users perform save, restore, view, and delete operations, see the IBM Cloud Manager with OpenStack User Guide.

Deleting a virtual server

When a virtual server is deleted, all the saved images are deleted at the same time. There is no option to keep images beyond the life of the virtual server.

Approvals

The save and restore functions can be configured for approval control. This requires an IBM Cloud Manager with OpenStack administrator to first approve any save or restore request.

Note: If the virtual server is powered on, the save function powers down the virtual server before starting the save operation. If the approval process is enabled, the virtual server remains powered on until the administrator approves the save or restore request. There is no approval process for deleting a saved virtual server image. To enable the approval process, see "Managing approval policies" on page 227.

Authorization

Only the creator of an instance, an IBM Cloud Manager with OpenStack administrator, or the project owner is allowed to save, restore, or delete a virtual server image. Users within the same project are not allowed to perform save, restore, or delete operations on other user images within a project.

Notifications

The save, restore, and delete images functions log events to the IBM Cloud Manager with OpenStack event log. In addition, save image and restore image operations send email notifications, if the user configuration is enabled to receive email notifications.

For more information about email notifications, see "Configuring email notifications" on page 171.

Setting saved image limit:

By default, IBM Cloud Manager with OpenStack allows you to keep up to three saved virtual server images.

About this task

To change this limit, follow these steps:

Procedure

1. Open the `deployment.properties` file.
2. Update the `com.ibm.cfs.vs.max.backups` property.

   For example, to keep 10 saved virtual server images, change the property to the following setting:

   ```
   com.ibm.cfs.vs.max.backups=10
   ```
3. Save the `deployment.properties` file.
4. Restart the IBM Cloud Manager with OpenStack server.

VMware datastore assignment during deployment:

There is a new deployment property that you can set to select the target storage to be used when you deploy a virtual image. You can set the **Target Storage** property value to *datastores* or *datastore clusters* that are attached to the selected deployment target. If the selected deployment target is changed, the target storage value is updated to match what is available on the newly selected deployment target. IBM Cloud Manager with OpenStack always sets the default target storage value to use the default storage selection algorithm.

The default storage selection algorithm retrieves the list of datastores and datastore clusters that are associated with the deployment target. It then selects one of the datastores or datastore clusters that is backed by a block device that has enough free space to contain the virtual machine disk sizes. If a block storage cannot be selected, then the appropriate NFS file storage, with the largest free space is chosen. If there is no available storage, the deployment fails.

You can specify a set of datastores and datastore clusters for the selection algorithm to exclude or include or both. Set the `com.ibm.cfs.cloud.vmware.enable.clone.template.properties` property in the `vmware.properties` file to `true`. To exclude datastores and datastore clusters from being selected, edit the `com.ibm.cfs.cloud.vmware.datastore.exclude.list` property and add a comma-separated list of datastore and datastore cluster names. To set the datastores and datastore clusters that can be selected, edit the `com.ibm.cfs.cloud.vmware.datastore.include.list` property and add a comma-separated list of datastore and datastore cluster names.

Note: By default, the selection algorithm includes all of the datastores and datastore clusters that are associated with the deployment target.

For example,

```
com.ibm.cfs.cloud.vmware.enable.clone.template.properties=true
com.ibm.cfs.cloud.vmware.datastore.exclude.list=dscluster3,localdisk4
com.ibm.cfs.cloud.vmware.datastore.include.list=localdisk1,dscluster2
```

To disable the algorithm, specify the datastore that you want to use in the `com.ibm.cfs.cloud.vmware.target.datastore.names` property.

For example:

```
com.ibm.cfs.cloud.vmware.enable.clone.template.properties=true
com.ibm.cfs.cloud.vmware.target.datastore.names=san,san,san
```

Each datastore that is listed is for a different virtual disk. The first entry is the datastore where the virtual server configuration files are located. The subsequent datastores in the list are for the virtual system hard disk devices. For example, if your virtual server has three disks you must specify four datastores in this list. These datastores can all be the same datastore or a combination of different datastores. If the first entry is for a datastore cluster, then the remaining entries are ignored. The datastore cluster is used for both the configuration files and disks. Datastore clusters are ignored when specified for subsequent entries in the list.

These `vmware.properties` file changes apply globally to IBM Cloud Manager with OpenStack and therefore to all deployment targets. Make sure that you specify datastores and datastore clusters that are available to all hosts that are the potential targets for every image. You cannot use the include list and datastore names properties, if the following is true:

- You have multiple cluster targets, each with its own set of storage, that is managed by the same vCenter.
- You want IBM Cloud Manager with OpenStack to target all the clusters.

In the datastore names property, you can specify different datastores for different disks if your virtual server templates have more than one disk.

Note:

- Datastore clusters are only available when you are using vSphere 5 Enterprise Plus edition. For more information about configuring and using datastore clusters, see the vSphere documentation.
- When you create the `vmware.properties` file, you must restart IBM Cloud Manager with OpenStack server. However, changes made to the property file after you restart the server are automatically updated.

Setting VMware user data during deployment:

When you deploy an image, you can set user data for the deployed virtual machine by using instance customization. The user data customization enables you to pass your own configuration information to the deployed virtual machine. If this customization fails during deployment, IBM Cloud Manager with OpenStack displays the instance in FAILED state.

About this task

IBM Cloud Manager with OpenStack does not require a specific content or format for the user data. Other than base64 decoding, IBM Cloud Manager with OpenStack passes the data unchanged to the guest. It is therefore the responsibility of the guest provider to process the user data. This usually requires writing and configuring a startup script to read this data from the CD device. IBM Cloud Manager with OpenStack does not provide nor recommend any particular script.

IBM Cloud Manager with OpenStack supports base64 encoded and plain text user data. The default value is set to base64 encoded. If decoding the user data fails, the user data is treated as plain text. IBM Cloud Manager with OpenStack passes the decoded user data to the deployed virtual machine through a CD backed by an ISO file. This gives the virtual machine access to the user data through the `user-data` file on one of its CD devices.

IBM Cloud Manager with OpenStack must be configured properly to create an ISO file that contains the user data. When IBM Cloud Manager with OpenStack is installed on Linux, the the **`mkisofs`** or **`genisoimage`** binary must exist in the `/usr/bin` directory.

In addition, you can also set the following properties in the `vmware.properties` file to control the user data:

com.ibm.cfs.cloud.vmware.user.data.file.name
The name of the file on the ISO that contains the actual user data. The default value is *user-data*.

com.ibm.cfs.cloud.vmware.user.data.iso.temp.path
The name of the path that is used to temporarily store ISO files on the IBM Cloud Manager with OpenStack server. The default value is the IBM Cloud Manager with OpenStack home directory. This path must end with a path separator, such as '`/`' on Linux.

Note:

- The ISO files that are created are managed by IBM Cloud Manager with OpenStack and not VMware. As a result, when you delete a virtual machine outside of IBM Cloud Manager with OpenStack, such as through the vSphere client interface, the ISO file that is created for the virtual machine is not removed.
- The ISO file of the virtual machine that contains the user data is not preserved with any saved virtual server images or capture instances that are created from the virtual machine.

Set secure access during deployment:

When you deploy a Linux image, you can set secure access to the deployed virtual machine by using instance customizations.

Using these optional customizations, you can set the password or SSH public key or both for a user on the guest operating system. If these customizations fail during deployment, IBM Cloud Manager with OpenStack displays the instance in FAILED state. You can set secure access for a root or a non-root user.

IBM Cloud Manager with OpenStack must be provided with the current root user name and password for the guest operating system to set secure access during deployment. In addition, IBM Cloud Manager with OpenStack uses VMware guest operations to complete the customizations and there are special requirements for performing VMware guest operations. For more information, see "Requirements for VMware guest operation" on page 183.

When you set a password for a user, access the IBM Cloud Manager with OpenStack server by using a secure connection. This ensures that the password is encrypted when sent to the IBM Cloud Manager with OpenStack server. For more information, see "Configuring secure shell (SSH) communication" on page 164.

When you set an SSH public key for a user, the guest operating system must have OpenSSH installed and configured to take advantage of this customization. In addition, the SSH public key must be specified according to the OpenSSH authorized_keys file format. For more information about OpenSSH, see http://www.openssh.org/.

Resetting secure access during capture:

When you capture a Linux instance, the SSH public keys for a user are removed from the guest operating system if they were set by IBM Cloud Manager with OpenStack when the instance was deployed.

Note: For more information, see "Set secure access during deployment."

Removing the SSH public keys prevents the keys from being available to instances deployed from the captured image. If the SSH public keys are unable to be removed during capture, IBM Cloud Manager with OpenStack displays warning messages in the image logs. In such cases, you must manually remove the SSH public keys for the user.

IBM Cloud Manager with OpenStack needs the current root user name and password for the guest operating system to reset secure access during capture. IBM Cloud Manager with OpenStack obtains this information from the virtual server credentials, which are initially set based on the instance customizations. The virtual server credentials can be reset later if changed in the guest operating system after deployment. For more information, see the *GET* and *PUT /instances/{id}/virtualServers/{id}/credentials* REST APIs in the IBM Cloud Manager with OpenStack Software Development Kit (SDK) Reference guide.

IBM Cloud Manager with OpenStack uses VMware guest operations to reset secure access during capture and there are special requirements for performing VMware guest operations.

Note: For more information, see "Requirements for VMware guest operation" on page 183.

Waiting for a deployed virtual machine (VMware):

IBM Cloud Manager with OpenStack provides a deployment property that enables users to specify whether to wait for a deployed virtual machine to be started and ready for use before it reports the newly deployed instance in OK state.

About this task

This deployment property option is labeled "Wait for the deployed virtual machine to be started and ready for use." When this option is enabled, IBM Cloud Manager with OpenStack displays the instance in a FAILED state, if the deployed virtual machine is not started and ready for use in the allotted time. A failure can be caused by problems during the customization process (for example, specifying an incorrect Windows product key) or if the virtual machine cannot be powered on.

If VMware Tools is installed on the guest operating system, the virtual machine is considered started and ready for use when the virtual machine is powered on and the necessary network customizations are completed for it. If VMware Tools is not installed, then only the powered on state is checked.

You can configure the amount of time to wait for a deployed virtual machine to be started and ready for use by setting the *com.ibm.cfs.cloud.vmware.deployed.vm.start.wait.time* in the `vmware.properties` file. The time is in seconds and defaults to 2,700 (or 45 minutes). For example, *com.ibm.cfs.cloud.vmware.deployed.vm.start.wait.time=1800*

You can also configure the default value for this deployment property by setting *com.ibm.cfs.cloud.vmware.default.deployed.vm.start.wait* in the `vmware.properties` file. The default value is *false*, which disables the option so that IBM Cloud Manager with OpenStack reports a newly deployed instance in OK state as soon as VMware powers on the virtual machine. You can override the *com.ibm.cfs.cloud.vmware.default.deployed.vm.start.wait* setting when you configure or deploy an image. For example, *com.ibm.cfs.cloud.vmware.default.deployed.vm.start.wait=true*.

Note:

- The wait time starts after IBM Cloud Manager with OpenStack attempts to power on the deployed virtual machine.
- This deployment property applies globally to IBM Cloud Manager with OpenStack and therefore to all VMware deployments.
- When you create the `vmware.properties` file, you must restart IBM Cloud Manager with OpenStack server; however changes made to the property file after that are picked up automatically.

- During deployment, some optional instance customizations require the deployed virtual machine to be started and ready for use before the customizations can be completed. In such cases,IBM Cloud Manager with OpenStack waits for the deployed virtual machine regardless of the value that is specified for this deployment property.

  Note: For example, see "Set secure access during deployment" on page 181.

Requirements for VMware guest operation:

VMware guest operations are used to perform certain optional customizations of instances.

When you request such customizations, your request must meet the following requirements to successfully perform the VMware guest operations:

1. vCenter version 5.0 or later is required.
2. The vSphere host machine that is used for the instance must be at version 5.0 or later and IBM Cloud Manager with OpenStack must have network connectivity to it.
3. VMware tools must be installed and current on the guest operating system for the virtual machine.
4. VMware guest operations must be enabled for both the virtual machine and the host machine. They are enabled by default, but can be disabled.

Note: If it is necessary to connect to the host machine to complete the VMware guest operations, IBM Cloud Manager with OpenStack automatically accepts the security certificate for the host machine. The security certificate is stored in the `<host machine>.jks` file in your IBM Cloud Manager with OpenStack home directory.

Configuring shutdown of VMware instances:

In previous versions of IBM Cloud Manager with OpenStack stopping an active instance of VMware instantly powered off the running instance. The virtual machine was given no delay to allow it to perform its own shutdown process. IBM Cloud Manager with OpenStack now provides a 90-second delay for the system to complete the shutdown process. If by the end of 90 seconds the system is not shut down, IBM Cloud Manager with OpenStack forces the VMware instance to power down immediately.

You can configure the behavior of how VMware instances are shut down by modifying the following statements in `vmware.properties`:

com.ibm.vmware.client.shutdown.delay.in.milliseconds=90000
: This property allows the VMware instance time to shut down before a power off is called. The default is 90000 milliseconds if the property is not specified. Setting this property to `0` (zero) prevents a shutdown from being called.

com.ibm.vmware.client.disable.save.image.shutdown=false
: This property disables shutdown when save image is called. The default value is set to `false`, which allows shutdown to be called before save image. Specifying a value of `true` prevents a shutdown from being called on save image operations.

VMware limitations:

The following limitations apply to VMware and IBM Cloud Manager with OpenStack.

- The saved images are managed by IBM Cloud Manager with OpenStack and not VMware. Deleting an image outside of IBM Cloud Manager with OpenStack, such as through the vSphere client interface, does not remove the saved images.
- Properties that are defined in the `deployment.properties` file and the `vmware.properties` file are global to all users, instances, and images. There is no option to configure these options on a more granular level.

- If you have an image that is defined in IBM Cloud Manager with OpenStack and you rename the associated virtual machine template by using the vSphere Client, the name of the image in IBM Cloud Manager with OpenStack does not change. The IBM Cloud Manager with OpenStack image is still associated with the renamed template and can continue to be used. The image details page displays the renamed template name in the `Original name` field. You can manually change the name of the image by clicking the name of the image on the Images details page and pressing **Save**.
- If you have an image that is defined in IBM Cloud Manager with OpenStack and you convert it to a virtual machine by using the vSphere Client, the image in IBM Cloud Manager with OpenStack shows a state of `unknown`. This state is displayed because it is no longer a template on the VMware server; the conversion made it a virtual machine, which shows up as an IBM Cloud Manager with OpenStack instance. If the unknown IBM Cloud Manager with OpenStack image is no longer needed, it can be deleted. A deletion of the IBM Cloud Manager with OpenStack image does not affect the IBM Cloud Manager with OpenStack instance or virtual machine on the VMware server.
- In some cases, when you use special characters in names of VMware objects such as port group names and cluster names, the VMware API encodes these specials characters in a URL encoding scheme. For example a / character is encoded as a `%2f`. When the names are displayed in IBM Cloud Manager with OpenStack, the characters are not decoded. IBM Cloud Manager with OpenStack displays the encoded name. For example, if you have a cluster named `DRS/Cluster` it is displayed as `DRS%2f%Cluster`.
- IBM Cloud Manager with OpenStack creates and manages custom fields for internal use when using VMware virtual machines. The custom fields have a `"SKC_"` prefix and you should not modify or remove them using the vSphere client.

Configuring images with OpenStack

The following topics cover information to configure images in an OpenStack environment.

Customizing an OpenStack instance:

When an image is deployed, you might have to customize the resulting instance on startup to apply network configurations, login information, application settings, and so on, before the instance is ready for use.

About this task

IBM Cloud Manager with OpenStack provides a deployment property to enable OpenStack config drive support when deploying an image. This support is used to pass customizations (for example: server metadata, user data, personality files, and SSH keys) to an instance. The config drive can be accessed by any guest operating system capable of mounting an ISO9960 file system. Images that are built with a recent version of the cloud-init software package, or similar software package such as IBM SmartCloud init, can automatically access and apply the supported customizations that are passed to the instance by the config drive.

Note: For more information about the cloud-init software package and the customizations that it supports, see CloudInit.

IBM Cloud Manager with OpenStack also supports the Pluggable Configuration Strategy feature added by IBM to OpenStack. This feature is similar to the config drive support in that it provides an instance with the necessary customizations. Like config drive, the image must be built with the correct software package for the configuration strategy to automatically access and apply the customizations. In particular, this feature provides support for Open Virtualization Format (OVF) or Microsoft Windows System Preparation (Sysprep) configuration. For more information, see the following resources:

- For information about OVF configuration, see Open Virtualization Format (OVF).
- For information about Sysprep configuration, see Sysprep Technical Reference.

Cloud-init software package:

IBM Cloud Manager with OpenStack supports the cloud-init software package.

When you deploy an image with config drive enabled, IBM Cloud Manager with OpenStack makes the instance customizations available to cloud-init using the OpenStack config drive support. The cloud-init software package can then access the config drive and apply the customizations to the instance. The following are some of the customizations made available through the config drive:

1. User data
2. Personality files
3. SSH key pair
4. Network adapter information (for static networks)
5. Password of the default user (the `password` option)

Using IBM Cloud Manager with OpenStack, you can enter the contents of the user data and personality files by using the deployment properties. You can enter the contents when you configure or deploy an image. The contents can be either base64 encoded or plain text. There are also deployment properties for the SSH key pair and network adapters that are based on the SSH key pairs and networks available. You can set the network adapters when you configure or deploy an image. However, the SSH key pair should not be set when you configure an image because OpenStack SSH key pairs are scoped to a user. Instead, the user who deploys the image should select an appropriate SSH key pair.

Note:

- Config drive is ignored when deploying PowerVC images. As a result, the instance customizations that are passed by the config drive are also ignored.
- The cloud-init `password` option sets the password for the default user, which is usually not the root user.
- For more information about the cloud-init software package and the customizations that it supports, see CloudInit.
- For more information about the OpenStack config drive support, see Config drive.

Configuration strategies:

IBM Cloud Manager with OpenStack supports the OVF and Sysprep types of pluggable configuration strategies.

When an image is deployed that has one of these configuration strategies, the OpenStack Pluggable Configuration Strategy feature determines the customizations made available to the instance and how they are made available. The appropriate software package (for the configuration strategy type) on the image is expected to access and apply the customizations. The customizations that are provided by OpenStack come from the following sources:

1. Server metadata that is provided by OpenStack itself.
2. Server metadata that is provided by the user deploying the image.

The following server metadata is provided by OpenStack:

```
server.admin_password            Random administrator password generated by OpenStack.
server.hostname                  The hostname for the instance.
server.domainname                Domain name from the dhcp_domain configuration option.
server.dns-client.pri_dns        Primary DNS server IP address.
server.dns-client.sec_dns        Secondary DNS server IP address.
server.dns-client.dns_list       Space separated list of DNS server IPs.
server.network.[n].mac           Mac address for network interface number n.
server.network.[n].mac_alt       Mac address formatted with '-' rather than ':'.
server.network.[n].slotnumber    Slot number for network interface number n.
                                 Defined as the decimal value of the last two digits
                                 of the mac address.
server.network.[n].[v4|v6].address  IPv4 or IPv6 address for network interface number n.
server.network.[n].[v4|v6].netmask  IPv4 or IPv6 netmask for network interface number n.
server.network.[n].[v4|v6].cidr     IPv4 or IPv6 address and netmask in CIDR notation
                                    for network interface number n.
server.network.[n].[v4|v6].gateway  IPv4 or IPv6 gateway for network interface number n.
server.network.[n].v4.use_dhcp      'true' if the network uses DHCP.
```

Server metadata that is provided by the user during deployment are prefixed with 'server.metadata'.

Creating a configuration strategy:

A complete and accurate OVF or Sysprep configuration strategy is important to ensure that an image can be deployed and customized properly. A poor configuration strategy can cause the deployment to fail or prevent the instance from being customized.

About this task

A configuration strategy consists of the following parts:

- Type
- Template
- Mapping
- User metadata

For information about how to add, update or delete the configuration strategy of an image, see “Updating an image configuration strategy (OpenStack only)” on page 218.

Type The type is required and can either be ovf or sysprep.

Template
The template is required. When you are using an ovf configuration strategy type, this contains the OVF descriptor for the image. When you are using a sysprep configuration strategy type, this contains the template unattend.xml file for the image.

Mapping
The mapping is required. It defines how to map the server metadata that is provided by both OpenStack and the user deploying the image to the appropriate elements/parts of the template. The mapping is a JavaScript Object Notation (JSON) array of objects, where each object has a source representing the server metadata to map to the target element/part in the template. For example:

```
[
  {
    "source": "server.network.1.v4.address",
    "target": "com.ibm.vsae.2_1.network-interface.ipaddr"
  },

  {
    "source": "server.network.1.v4.netmask",
    "target": "com.ibm.vsae.2_1.network-interface.netmask"
  },

  {
    "source": "server.network.1.v4.gateway",
    "target": "com.ibm.vsae.2_1.network-interface.gateway"
  },

  {
    "source": "server.hostname",
    "target": "com.ibm.vsae.2_1.system-host.hostname"
  },
  {
    "source": "server.domainname",
    "target": "com.ibm.vsae.2_1.system-host.domainname"
  },

  {
    "source": "server.dns-client.pri_dns",
    "target": "com.ibm.vsae.2_1.dns-client.pri_dns"
  },

  {
    "source": "server.metadata.username",
    "target": "com.ibm.vsae.2_1.system-user.username"
  },

  {
    "source": "server.metadata.system.password",
    "target": "com.ibm.vsae.2_1.system-user.password"
  }
]
```

IBM Cloud Manager with OpenStack uses the mapping to create additional deployment properties for the image. Every object in the mapping with a source prefix of `'server.metadata.'` is added to the configurable deployment properties for the image. Doing so allows such properties to be customized by the user when the image is deployed. For more information about defining the mapping, see “OVF configuration strategy” on page 188 and “Sysprep Configuration Strategy” on page 190 topics.

Note:

- The same source can be mapped to multiple targets. To do this, you must define a separate source/target object in the JSON array for each mapping.
- An empty mapping (for example, []) must be used only for testing purposes since all deploys will use the same template and thus have the same customizations applied.
- When you define a source mapping name with the `'server.metadata.'` prefix, avoid using `'.'` in the suffix portion of the name.

User Metadata

The user metadata is optional. It determines how IBM Cloud Manager with OpenStack defines, displays, and processes the configurable deployment properties created based on the mapping. If no user metadata is provided for a mapping, a basic string deployment property is used. Defining detailed user metadata helps users properly configure and deploy the image. The user metadata is a JSON array of objects where each object might contain the following:

1. name
2. type
3. subtype
4. description
5. required
6. min
7. max
8. allowed_values
9. default_value

For example:

```
[
 {
  "name": "system.username",
  "type": "STRING",
  "description": "System user name",
  "required": "true"
 },
 {
  "name": "system.password",
  "type": "STRING",
  "subtype": "PASSWORD",
  "description": "System user password hash",
  "required": "true"
 }
]
```

The name string is required. The name corresponds to the mapping source without the `'server.metadata.'` prefix.

The type string is optional. It is the native type of the deployment property (INT, LONG, FLOAT, BOOLEAN, or STRING). The default is *STRING*.

The subtype string is optional. It is a more descriptive type to allow for early validation of the deployment property. A STRING type can have the following subtypes: *IPV4_ADDRESS, DOMAIN_NAME, DOMAIN_NAMES, IPV4_SUBNET_MASK, HOST_NAME and PASSWORD.* A BOOLEAN type can have the following subtypes: *DHCP_FLAG* and *DNS_FLAG*. The default is no specific subtype.

The description string is an optional description of the deployment property. If no description is provided, the name is used for the description.

The required flag is optional. It is a flag indicating whether the deployment property is required when deploying the image. The default is false.

The min and max strings are optional. They provide minimum and maximum boundaries for *INT, LONG, FLOAT* and *STRING* type deployment properties. The default is no boundaries.

The *allowed_values* string is optional. It is a comma-separated list of allowed values for the deployment property. When you specify a list of allowed values, also provide the *default_value* and ensure that the allowed values are valid for the type. The default is any allowed values corresponding to the type.

The *default_value* string is optional. It is the default value for the deployment property. The default value should be valid for the type. If no default value is provided, a value must be explicitly set by the user in order for the deployment property to be used when deploying the image.

OVF configuration strategy:

The OVF configuration strategy is an example of an OpenStack Pluggable Configuration Strategy. It is designed for use with OVF configuration, which is a way to package and provide configuration options for an image.

About this task

The OVF configuration strategy supports OVF version 1.1. For more information about OVF standards, see Open Virtualization Format (OVF).

The OVF configuration strategy passes the configuration options in an `ovf-env.xml` file in a disk that is presented to the guest system. It is expected that an activation engine, such as IBM VSAE, embedded in the image mounts the drive, read the `ovf-env.xml`, and apply the customizations when an instance deployed from the image starts.

The `ovf-env.xml` file is created based on the default values in the OVF descriptor (that is, the template in the configuration strategy) and the configuration options that are mapped using the mapping that is specified in the configuration strategy.

To know what mappings to specify in the configuration strategy, you must know the properties that the image expects in the `ovf-env.xml` file. The properties that the image expects in the `ovf-env.xml` are specified in the OVF descriptor's ProductSection elements, as documented in the OVF 1.1 specification, section 9.5. Here is an example ProductSection from an OVF descriptor:

```
<ovf:ProductSection ovf:class="com.ibm.vsae.2_1.network-interface">
 <ovf:Info>System network interface configuration</ovf:Info>
 <ovf:Property ovf:key="ipaddr" ovf:type="string" ovf:userConfigurable="true"
  ovf:value="192.168.71.129">
  <ovf:Description/>
  <ovf:Label>IP address</ovf:Label>
 </ovf:Property>
</ovf:ProductSection>
```

Using the previous example, the image can have a property *com.ibm.vsae.2_1.network-interface.ipaddr* that defaults to *192.168.71.129*. You might want to have the IP address set to the value that OpenStack assigns to it, which is given in the *server.network.1.v4.address* server metadata. To do this, you would create the following mapping:

```
{
 "source": "server.network.1.v4.address",
 "target": "com.ibm.vsae.2_1.network-interface.ipaddr"
}
```

Here is another example ProductSection:

```
<ovf:ProductSection ovf:class="com.ibm.vsae.2_1.ntp-client">
 <ovf:Info>activates the openntp client</ovf:Info>
 <ovf:Property ovf:key="ntp-server" ovf:type="string" ovf:userConfigurable="true"
  ovf:value="0.pool.ntp.org">
  <ovf:Description>Ntp server</ovf:Description>
  <ovf:Label>Ntp server</ovf:Label>
 </ovf:Property>
</ovf:ProductSection>
```

Using the previous example, there is no OpenStack provided server metadata that contains the NTP server's IP address. Therefore, if you want users to be able to override the value when they deploy the image, you would create the following `'server.metadata.'` mapping:

```
{
 "source": "server.metadata.ntp-server",
 "target": "com.ibm.vsae.2_1.ntp-client.ntp-server"
}
```

The OVF configuration strategy also supports using the wildcard character * to map multiple server metadata items that are provided by OpenStack using a single source/target mapping. When the wildcard character is used, the system matches existing configuration properties against the source to generate targets for the wildcard matches. This support is useful when you need to dynamically add network adapters at the time you deploy an image. Here is an example mapping that uses the wildcard character:

```
{
  "source": "server.network.*.v4.address",
  "target": "com.ibm.vsae.2_1.network-interface.ipaddr.*"
}
```

```
If the following server metadata items were provided by OpenStack when deploying an image:
server.network.1.v4.address = 192.168.1.101
server.network.2.v4.address = 192.168.1.102
server.network.3.v4.address = 192.168.1.103

Then the following mapping would be generated when deploying the image:
[
  {
    "source": "server.network.1.v4.address,
    "target": "com.ibm.vsae.2_1.network-interface.ipaddr.1"
  },
  {
    "source": "server.network.2.v4.address,
    "target": "com.ibm.vsae.2_1.network-interface.ipaddr.2"
  },
  {
    "source": "server.network.3.v4.address,
    "target": "com.ibm.vsae.2_1.network-interface.ipaddr.3"
  }
]
```

The wildcard character support has the following restrictions:

1. The wildcard character replaces a string of decimal digits only that translates internally to regular expression *'d+'*.
2. The mapping source must have only one wildcard character.
3. The mapping target must have at least one wildcard character. If more than one wildcard character is used, they are all replaced.

Note: The OVF configuration strategy has the following limitations:

- The OVF configuration strategy support is only for image activation (that is, ProductSection elements) and does not support actions such as adding disks to the image.
- After activation is complete, OpenStack does not automatically detach the disk drive that contains the `ovf-env.xml` file.
- Extensions to IBM VSAE might be required to support network configurations with both IPv4 and IPv6 addresses.

Sysprep Configuration Strategy:

The Sysprep configuration strategy is an example of an OpenStack Pluggable Configuration Strategy. It is designed for use with Microsoft Windows System Preparation (Sysprep) configuration, which allows customizing many aspects of a Windows system as it starts. For more information about Sysprep, see Sysprep Technical Reference.

The Sysprep configuration strategy passes the image configuration options in an unattend.xml file in a CD-ROM device that is presented to the guest system. Before adding the Sysprep configuration strategy to an image, it is expected that the image is ready for Sysprep, and that it runs Sysprep to read the unattend.xml file, and apply the customizations when starting an instance deployed from the image.

The unattend.xml file is created based on the default values in the template unattend.xml file (that is, the template in the configuration strategy) and the configuration options that are mapped using the mapping that is specified in the configuration strategy. To know what mappings to specify in the configuration strategy, you must know the properties that the image expects in the unattend.xml file.

The format of the target values in the configuration strategy mapping is as follows:

- To identify an element, the format is an XPATH. In this case, the contents of the element are replaced with the value of the source configuration property.
- To identify an attribute, the format is like XPATH@attribute-name. In this case, the attribute in the element is set to the value of the source configuration property.

For documentation on the XPATH format, see the python documentation. If the path identifies more than one element, only one of the elements are the target element. If the path does not identify an element in the template the boot of the instance fails with an error.

Example template unattend.xml file:

```
<?xml version="1.0" encoding="utf-8"?>
<unattend xmlns="urn:schemas-microsoft-com:unattend">
 <settings pass="oobeSystem">
  <component name="Microsoft-Windows-Shell-Setup" processorArchitecture="amd64"
 xmlns:wcm="http://schemas.microsoft.com/WMIConfig/2002/State">
   <Display>
    <ColorDepth>16</ColorDepth>
    <HorizontalResolution>1024</HorizontalResolution>
    <RefreshRate>60</RefreshRate>
    <VerticalResolution>768</VerticalResolution>
   </Display>
   <RegisteredOrganization>OpenStack</RegisteredOrganization>
   <OOBE>
    <HideEULAPage>true</HideEULAPage>
    <NetworkLocation>Cluster</NetworkLocation>
    <ProtectYourPC>1</ProtectYourPC>
    <SkipMachineOOBE>true</SkipMachineOOBE>
    <SkipUserOOBE>true</SkipUserOOBE>
   </OOBE>
  </component>
 </settings>
</unattend>
```

Using the above example, the following mapping target would identify the ColorDepth element: *.//{urn:schemas-microsoft-com:unattend}Display/{urn:schemas-microsoft-com:unattend}ColorDepth*

Using the above example, the following mapping target would identify the processorArchitecture attribute in the component element: *.//{urn:schemas-microsoft-com:unattend}component[@name='Microsoft-Windows-Shell Setup']@processorArchitecture*

Considerations for capturing an OpenStack instance:

Consider the following information before capturing an OpenStack instance.

When you capture an instance that was deployed by using a pluggable configuration strategy (OVF or Sysprep), the configuration strategy is copied from the source image for the instance to the new image. If the source image for the instance was deleted, the configuration strategy cannot be copied to the new image. As a result, you need to manually add the configuration strategy to the new image.

After an instance is deployed using a configuration strategy, the activation software (for example, Sysprep or IBM VSAE) has run and applied the configuration. Therefore, you might have to perform more actions when you capture the instance. If you want the activation software to run again when you deploy the image that was created, the activation software must be reset. If you do not have to run the activation software again, you can delete the configuration strategy from the image that was created.

For more information about the reset requirements and other capture prerequisites, see the documentation for the applicable activation software. For more information about pluggable configuration strategies, see “Configuration strategies” on page 185.

Configuring PowerVC images

Use the following information to configure PowerVC images with IBM Cloud Manager with OpenStack.

About this task

Placement policy

IBM Cloud Manager with OpenStack provides a deployment property to control the placement of a deployed PowerVC virtual machine. The placement of the virtual machine can either be handled by the OpenStack scheduler or the PowerVC scheduler. This deployment property option is labeled **Use the PowerVC scheduler to place the deployment**. Select the appropriate option for your environment.

- When this option is enabled, the PowerVC scheduler is used.
- When this option is disabled, the OpenStack scheduler is used.

Note: This option is enabled by default.

Network adapter configuration
OpenStack images to be deployed only to PowerVC support VLAN type networks with a physical network name equal to "default". Such networks must also exist in the PowerVC environment. In addition, if the network supports both IPv4 and IPv6 addresses, only the IPv4 addresses are used by PowerVC.

Flavor storage size
PowerVC does not support resizing during image deployment. However, you can resize the virtual machine after it is successfully deployed. As a result, regardless of the OpenStack flavor that is selected, PowerVC uses the size of the image as the storage size of the deployed PowerVC virtual machine. For more information about PowerVC flavors, see the PowerVC Information Center.

Config drive and virtual machine customizations
PowerVC does not support config drive and the related virtual machine customizations during image deployment. If specified, these configurations are ignored. For more information about the cloud-init software package and the customizations that it supports, see “Cloud-init software package” on page 185.

Boot Volume Storage Template
By default, when you deploy an image, the boot volume is created using the default storage template, as configured on the PowerVC server. If you would like the boot volume to use a different storage template, you need to add the boot volume type property to the extra specifications of the flavor that is used to deploy the image. Edit the flavor and add the following extra specifications.

- Set the property key *powervm:boot_volume_type*
- Set the value of the property to the ID of the volume type you want to use.

You can find the volume type id by running the following OpenStack command: `cinder type-list`

Note: The volume type ID that is specified must be a PowerVC volume type. When you run a command in the IBM Cloud Manager with OpenStack appliance, PowerVC volume type names are prefixed with a *pvc:*. For more information about flavors, see Flavors.

Related reference:

PowerVC Standard Edition

Nova placement policy

Configuring instance resize timeout

IBM Cloud Manager with OpenStack allows the administrator to configure a timeout for an instance resize action. This is optional, but can be configured in the event that the cloud manager does not respond in a reasonable timeframe.

About this task

To configure the instance resize timeout, follow these steps:

Procedure

1. Open the `deployment.properties` file in the home directory.

2. Set the `com.ibm.cfs.deployments.resize.timeout` property to the time in minutes to wait for an instance resize action to complete in the cloud. The default value is 10 minutes.
3. Save the `deployment.properties` file and restart the IBM Cloud Manager with OpenStack server.

Identifying expired instances

IBM Cloud Manager with OpenStack has a configurable task that allows administrators to identify expired instances and how long to keep them after they have expired.

About this task

To set how often expired instances are identified and how long they are kept, follow these steps:

Procedure

1. Open the `deployment.properties` from your home directory.
2. Configure each property in the file.
   a. `com.ibm.cfs.expired.deployments.finder.interval=10`

      When the expiration date is reached, the deployment property is put into an `EXPIRED` state and the virtual machine is stopped in the deployment. The `com.ibm.cfs.expired.deployments.finder.interval` defines how often IBM Cloud Manager with OpenStack identifies expired deployments. This interval is set in seconds.

   b. `com.ibm.cfs.deployments.expired.delete.interval=1`

      This property defines the interval for deleting instances that have been identified as expired. The unit is hour. If not set or valid, the default value is 24 hours.

      This property is also defined by the length of the grace period set when you create an expiration policy for a cloud or a project. For more information, see “Managing expiration policies” on page 230.

Configuring multiple instances for a single deployment

You can deploy multiple instances through a single deployment.

About this task

If you enable the multiple instance deployment function, a user can deploy multiple instances through a single deployment. The deployed instances use the deployment name as the prefix of each single instance. The new names also use **-x** as the suffix, where **x** is the index of that instance.

Procedure

1. To enable or disable this feature, set the following property value within the `deployment.properties` file that is in the `.SCE42` directory:
   - **com.ibm.cfs.deployments.multi.enabled=true** to enable the function.
   - **com.ibm.cfs.deployments.multi.enabled=false** to disable the function.

   Note: By default, this feature is enabled.
2. To control the maximum number of instances that a user is allowed to deploy at one time, set the following property value within the `deployment.properties` file:

   com.ibm.cfs.deployments.multi.max.value=5

   Note:
   - The default value is 5.
   - If this value is set too high, it might overload the connected cloud.

Configuring logging

Log files are automatically saved by the IBM Cloud Manager with OpenStack self-service portal. You can configure the default number of log files that are saved and the types of messages that are logged.

About this task

By default, the self-service portal saves 9 log files of 50 MB each. These defaults can be modified in the `logging.properties` file in the home directory.

To change the default logging options:

Procedure

Open the `logging.properties` file in the home directory.

- To change the number of log files that are saved, set the `java.util.logging.FileHandler.count` property to the number of log files that you to save. The default is `9`.
- To change the types of messages that are saved, set the `java.util.logging.FileHandler.level` property to the level of messages that you want to receive. The default is `INFO`.

  The types of messages that are logged in the log file are informational, warning, and error messages. Use the debugging messages only for troubleshooting and debugging purposes because performance can be impacted by excessive logging.

What to do next

Modifying the `logging.properties` file requires restarting the self-service portal server to pick up the changes.

For more information about logging, see Chapter 10, “Troubleshooting and support for IBM Cloud Manager with OpenStack,” on page 291.

Configuring a network

The IBM Cloud Manager with OpenStack self-service portal provides a convenient way to manage and apply network settings by using network configurations. Network configurations are a group of network settings for a particular environment, typically a virtual network. These settings can be managed as a single entity and applied to image configurations or instance deployment settings.

For example, suppose that a cloud environment contains two virtual networks applicable to instance deployment: a public and a private virtual network. In this case, an administrator might create two network configurations, one for the public and one for the private. In the public configuration, the administrator would specify all the public network settings such as primary DNS, secondary DNS, and primary gateway. The same would be done for the private network configuration. After the configurations are created, the administrator can configure the images to use the appropriate network configuration. This action saves time by not requiring the administrator to specify each network setting in each image. It also allows an easier way to manage the network settings on a virtual network.

While the actual settings specified in a configuration are tailored to a specific environment, the network configurations themselves are a superset of all network settings regardless of image, operating system, or cloud management system. Therefore, all settings that are specified in a configuration are applicable. For example, the primary and secondary WINS settings of a network configuration are only applicable to Windows based images. So when you create a configuration for an image that is not using Windows, these values are not needed and can be left blank.

Note: With the self-service portal, you can specify the network configuration for a cloud. The self-service portal displays only the fields that are applicable for that cloud. Before you can create an OpenStack network configuration, you must select an existing OpenStack cloud.

When network configuration settings are applied to either an image configuration or during an advanced instance deployment, their individual settings can be overridden or manually specified, if wanted.

Note: You cannot override or manually specify OpenStack network configuration settings.

You can modify your network connections through the self-service portal or though the property files in the home directory. For more information about modifying your network connections through the self-service portal, see "Managing network configurations" on page 237.

Note: You cannot use property files to specify OpenStack network configuration settings. You must use the self-service portal.

To modify your network connections from the home directory, create a `.properties` file and save it to your home directory. The name of these files should be prefixed with `networkConfiguration` followed by an arbitrary suffix and the `.properties` file extension, similar to `networkConfiguration.properties`, `networkConfiguration-vlan1.properties`, or `networkConfiguration3.properties`.

Each property file contains a group of network setting. For example, assume that there is a file that is named `networkConfiguration.properties` in the home directory, which containing the following settings:

```
name=VLAN1
dns1=9.10.244.100
dns2=9.10.244.200
gateway1=9.5.40.1
gateway2=9.5.40.2
domain=mydomain.company.com
subnet=255.255.252.0
networkId=[Network 1]=hostVnet:ETHERNET0/1
useDHCP=false
hostnamePrefix=sce
computerNamePrefix=sce
workgroup=workgroup
description=default network configuration
9.5.42.250
9.5.42.251
9.5.43.23
```

Note: When you use a brocade switch, you must configure a host name prefix in the `networkConfiguration.properties` file: `hostnamePrefix=sce`.

When the self-service portal starts, the network configuration named "VLAN1" is added to the network configuration list.

(VMware only) In the VWware environment, the value of the *Network ID* field is the name of a VMware standard switch network, port group name, or distributed port group. A typical VMware network ID is *VM Network*. This value is used to assign the virtual network adapter to the VMware network during a deployment. The rest of the values in the network configuration should be appropriate for that network. The network configuration displays all available port groups and distributed port groups. Not all port groups or distributed port groups might be available on all target hosts. Validation of this field occurs only at deployment time when the actual deployment target is known. If the selected port group or distributed switch is not available on the selected target host, then an error occurs and the instance deployment fails.

Configuring billing

The IBM Cloud Manager with OpenStack self-service portal has a configurable billing and accounting interface. The interface allows the self-service portal to monitor resource use and create subsequent billing to the self-service portal user accounts for the usage.

For more information about accounts, see “Managing accounts” on page 251.

Configuring billing

To enable billing, edit the `billing.properties` file and define what action to take when an account becomes delinquent. Also, set the time intervals to determine accounts that are delinquent or at their account balance threshold.

About this task

Important: For billing to work, you must also enable metering. Account bills are generated based on metering results.

To configure billing, follow these steps:

Procedure

1. Open the `billing.properties` file in the home directory.
2. Configure each property in the file.

   `com.ibm.cfs.billing.enabled=true`
   Defines whether to enable the billing and accounting functionality in IBM Cloud Manager with OpenStack. True enables and false disables billing and accounting.

   `com.ibm.cfs.billing.delinquency.policy= com.ibm.cfs.services.billing.policies.shutdown`
   Determines the action IBM Cloud Manager with OpenStack takes against existing instances and volumes when an account becomes delinquent. Possible values are as follows:

Table 56.

Value	**Description**
com.ibm.cfs.services.billing.policies.destroy	This value destroy all deployments and detaches all volumes for the delinquent account.
com.ibm.cfs.services.billing.policies.shutdown	This value suspends all deployments for the delinquent account.
com.ibm.cfs.services.billing.policies.do.nothing	This value ignores delinquent accounts.
com.ibm.cfs.services.billing.policies.detach	This value detaches all volumes for the delinquent account.
com.ibm.cfs.services.billing.policies.delete	This value deletes all volumes for the delinquent account.
com.ibm.cfs.services.billing.policies.shutdowndetach	This value suspends all deployments and detaches all volumes for the delinquent account.
com.ibm.cfs.services.billing.policies.shutdowndelete	This value suspends all deployments and deletes all volumes for the delinquent account.
com.ibm.cfs.services.billing.policies.destroydelete	This value destroy all deployments and deletes all volumes for the delinquent account.

   `com.ibm.cfs.billing.delinquency.finder.interval=120`
   This property represents the number of seconds to wait before running a job that examines each account to determine whether the account is delinquent.

`com.ibm.cfs.billing.account.balance.threshold.interval= 24`
This property represents the number of hours to wait before running a job to find accounts that are at their account balance threshold. The default value of this property is 24 hours or 1 day.

Note:

- The `billing.properties` file is not configurable through the web user interface.
- For PowerVC support, the PowerVC driver file, `/etc/powervc/powervc.conf`, has staging user (staging_user) and project (staging_project_name) properties. These properties control which OpenStack user and project owns instances that are synchronized from PowerVC. The default configuration uses the IBM Cloud Manager with OpenStack administrator and the public project. An instance must be owned by a user in OpenStack, so when you enable billing, the default owner is also billed for those instances in the PowerVC cloud.

What to do next

After you enable billing, ensure that you also enable metering. For more information, see “Configuring metering” on page 200.

Configuring billing details

IBM Cloud Manager with OpenStack can produce charges that are billed back to users when using a specific cloud resource, such as an instance.

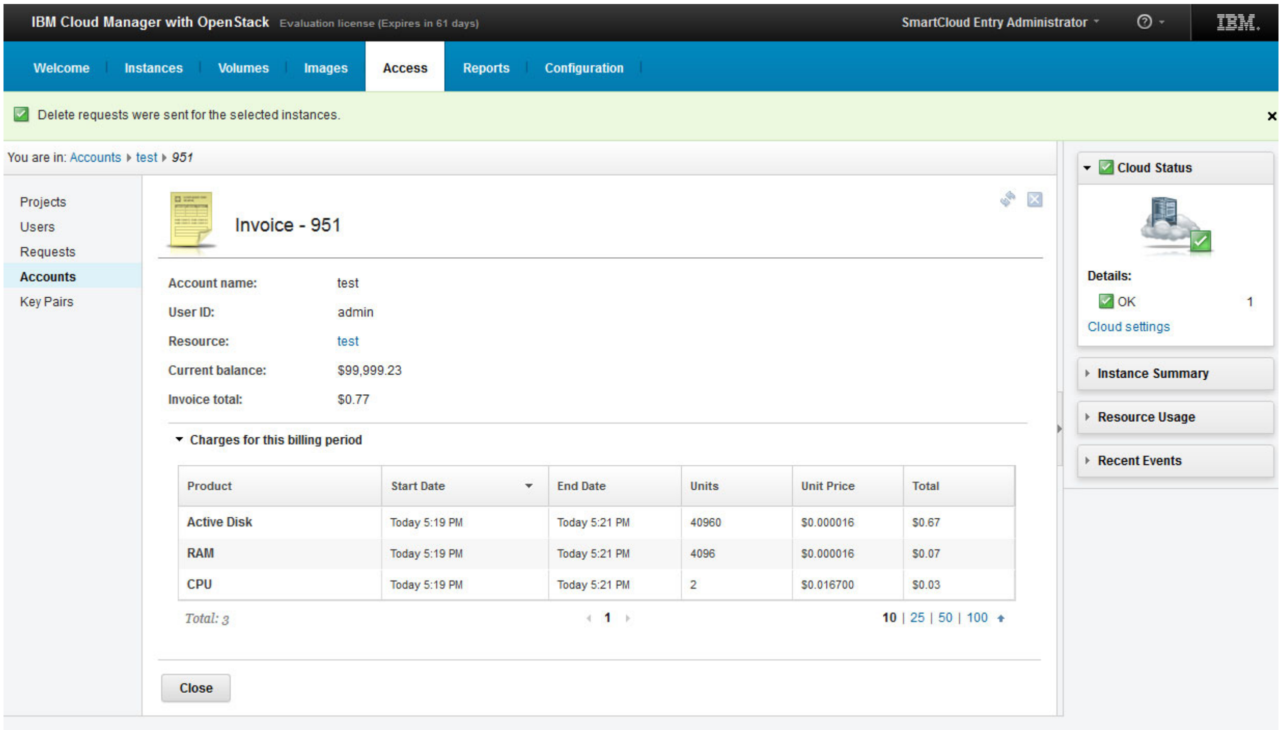
About this task

IBM Cloud Manager with OpenStack currently has the following configurable products:

Table 57. Configurable products by cloud type

OpenStack configurable products	VMware configurable products
• Processor • Memory • Disks • Volume	• Processor • Memory • Disks

A cloud product might be something similar to processor by the hour, 1 GB of RAM per day, a fixed rate charge for a running VM, or 20 GB of active disks per day. IBM Cloud Manager with OpenStack loads those cloud products into a product catalog. System events, such as deploying an instance, can cause the creation of a bill with one or more charges from one or more cloud products. IBM Cloud Manager with OpenStack automatically deducts money from the account to which the instance owner belongs.



Delete requests were sent for the selected instances.

Invoice - 951

Account name: test
User ID: admin
Resource: test
Current balance: $99,999.23
Invoice total: $0.77

Charges for this billing period

Product	Start Date	End Date	Units	Unit Price	Total
Active Disk	Today 5:19 PM	Today 5:21 PM	40960	$0.000016	$0.67
RAM	Today 5:19 PM	Today 5:21 PM	4096	$0.000016	$0.07
CPU	Today 5:19 PM	Today 5:21 PM	2	$0.016700	$0.03

Total: 3 1 10 | 25 | 50 | 100

Figure 1. Sample billing account summary

The settings for product price per interval time are configurable. To configure product pricing information, follow these steps:

Procedure

1. Open the `products` directory in the home directory to locate the product configuration files. The cloud type is added to the file name as a prefix as shown in the following examples:

   For OpenStack:

   - `Openstack_CPU.xml`
   - `Openstack_RAM.xml`
   - `Openstack_Disk.xml`.
   - `Openstack_Volume.xml`

   For VMware:

   - `VMware_CPU.xml`
   - `VMware_RAM.xml`
   - `VMware_Disk.xml`.

   The file that you configure depends on the cloud and product type.

2. Configure processor price in the *`cloud_type`*`_cpu.xml`.

   ```
   <pricing currency="USD" interval="3600" price="1.000"/>
   ```

   This property specifies that the default IBM Cloud Manager with OpenStack collector collects charges on virtual servers by using the number of processors that are assigned to them at a rate of $1.00 per hour. Collecting at an interval less than the actual described rate (for example, hours instead of days) enables users to get a more accurate approximation of their actual charges. Having an accurate look at the charges might be important for accounting purposes or in situations where account credit is limited.

3. Configure Memory price in *`cloud_type`*`_ram.xml`.

   ```
   <pricing currency="USD" interval="3600" price="0.000976563"/>
   ```

This property specifies that the default IBM Cloud Manager with OpenStack collector collects charges on virtual machines by using the number of bytes of RAM assigned to them at a rate of $0.000976563 per MB per hour, which is about $1.00 per hour per GB.

4. Configure disks in *cloud_type*_disk.xml.

   ```
   <cloudProduct id="com.ibm.cfs.cloud.vmc.products.storage">
   <name>Active Disk</name>
   <description>The amount of total disk storage in MB used in a workload
   per minute.</description>
   <!-- $1.627604167E-5 per megabyte per minute -->
   <pricing currency="USD" interval="60" price="1.627604167E-5"/>
   </cloudProduct>
   ```

   These properties specify that the default IBM Cloud Manager with OpenStack collector collects charges on virtual machines by using the disks that are assigned to them at a rate of $0.000976563 per MB per hour, which is about $1.00 per hour per GB.

   The <name> and <description> can also be overridden from the IBM Cloud Manager with OpenStack defaults by specifying different values.

   Note: The currency for all configurable products must be consistent. For example, set US dollar (USD) for both or Chinese Yuan (CNY) for both. Using inconsistent currencies causes incorrect product charges.

5. For OpenStack clouds, configure volume price in Openstack_Volume.xml.

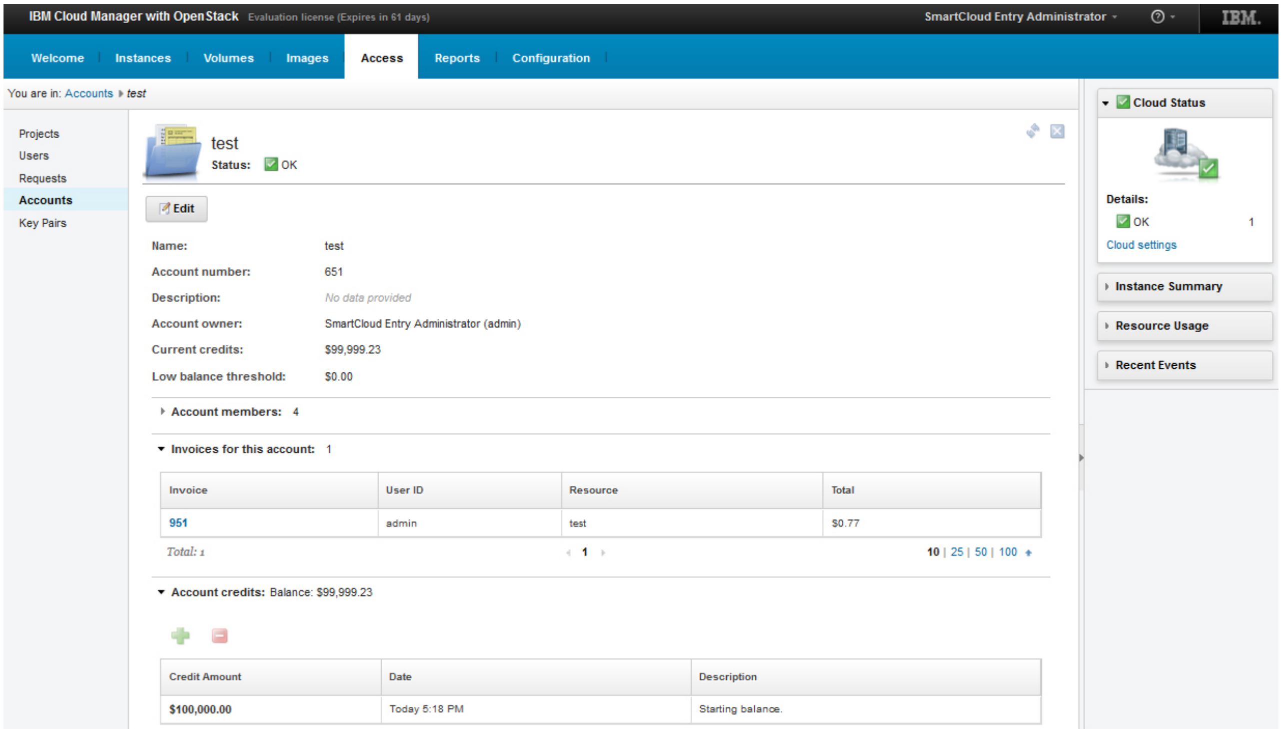
   ```
   <cloudProduct id="com.ibm.cfs.cloud.openstack.products.volume"
     cloudType="Openstack" objectType="Volume">
   <name>Volume</name>
   <description>The amount of a volume in MB per minute.</description>
   <!-- $1.627604167E-5 per megabyte per minute -->
   <pricing currency="USD" interval="60" price="1.627604167E-5"/>
   </cloudProduct>
   ```

   These properties specify that the default IBM Cloud Manager with OpenStack collector collects charges on volumes at a rate of $1.627604167E-5 per MB per hour, which is about $1.00 per hour per GB. The <name> and <description> can also be overridden from the IBM Cloud Manager with OpenStack defaults by specifying different values.

   Note: The currency for all configurable products must be consistent. For example, set US dollar (USD) for both or Chinese Yuan (CNY) for both. Using inconsistent currencies causes incorrect product charges.

Results

After you configure account billing, you can view account billing information in the IBM Cloud Manager with OpenStack interface.



test

Status: ✓ OK

Name: test

Account number: 651

Description: *No data provided*

Account owner: SmartCloud Entry Administrator (admin)

Current credits: $99,999.23

Low balance threshold: $0.00

Account members: 4

Invoices for this account: 1

Invoice	User ID	Resource	Total
951	admin	test	$0.77

Total: 1 1 10 | 25 | 50 | 100

Account credits: Balance: $99,999.23

Credit Amount	Date	Description
$100,000.00	Today 5:18 PM	Starting balance.

Figure 2. Sample billing account settings

Configuring metering

The IBM Cloud Manager with OpenStack self-service portal has a configurable metering framework that enables the self-service portal to record and present metering data.

About this task

You can download metering data files through the metering data API. To enable metering with the self-service portal, configure the following properties:

Procedure

1. Open the `metering.properties` file in the home directory.
2. Configure the property `com.ibm.cfs.metering.enabled=true` to enable the metering function within the self-service portal. The default value for this property is false.
3. Configure the property `com.ibm.cfs.metering.interval=<time in minutes>` where *<time in minutes>* is the time in minutes between each metering record synchronization. The default value is 1441, or every day. If you want a more frequent synchronization, you can decrease this value.
4. Configure the property `com.ibm.cfs.metering.data.path = cfshome/metricsdata/`. This property allows the administrator to configure the storage system where the metrics data is located. The default location is the self-service portal `home directory/metricsdata/` if not specified.
5. Configure the property `com.ibm.cfs.metering.data.export.interval = <interval time, hour as unit>`. This property is used for how often to export the metering data to file. The default value is 1 hour.
6. Configure the property `com.ibm.cfs.metering.data.expired.days = <day as unit>`. This property is used to set the number of days that the metering data is expired. The default value is 370 days.
7. Configure the property `com.ibm.cfs.statistics.interval = <interval time, seconds as unit>` This property is used to set the frequency of the synchronization of the statistics resource usage from the

cloud. By default, the self-service portal retrieves resource usage from the cloud. These statistics include processors in core, memory, and storage in megabytes. If the property is not set, a default of 60 seconds is used.

Results

After you configure usage metering, you can monitor the cloud resource usage from the self-service portal by selecting **Reports** > **Usage Metering**. View details about a specific virtual server by selecting the virtual server from the Usage metering grid.

For more information about using Usage Metering, see the IBM Cloud Manager with OpenStack User Guide.

Configuring capacity and overcommit rates

The capacity in the IBM Cloud Manager with OpenStack self-service portal indicates the total and used (or allocated) resources, including processors, memory, and storage.

The capacity view is enabled for all the supported virtualization environments. All x86 clouds support resource overcommit by the hypervisors. Therefore, the total amount of virtual resources that can be allocated are larger than the total physical resources available. Therefore, the self-service portal supports the ability to set an overcommit rate to limit the resource use.

Note: Overcommit rate is not supported for PowerVC virtualization environments.

The overcommit rate is represented in the following fields:

- *totalCpu* - Represents the physical processor cores that are multiplied by the processor overcommit ratio
- *totalMem* - Represents the physical memory size that is multiplied by the memory overcommit ratio

Note: Overcommitted storage is not allowed.

The capacity API tells administrators the amount of physical resources, the amount of resources (after overcommitted), and the resources that are allocated. The user interface shows the physical resource and the overcommit rate only. It excludes the amount of resources after they are overcommitted.

To configure the overcommit rate, open the `cloud.properties` file and set the following properties:

```
# The cpu overcommit rate in OpenStack cloud
com.ibm.cfs.openstack.overcommit.cpu=16
# The memory overcommit rate in OpenStack cloud
com.ibm.cfs.openstack.overcommit.memory=1.5

# The cpu overcommit rate in VMware cloud
com.ibm.cfs.vmware.overcommit.cpu=10
# The memory overcommit rate in VMware cloud
com.ibm.cfs.vmware.overcommit.memory=1.5

com.ibm.cfs.openstack.overcommit.memory is invalid for hyper-v hypervisor.
```

The self-service portal checks whether there are sufficient available resources when deploying. If the available resource is less than the requested resource, the self-service portal stops the deployment process. This feature can be enabled or disabled by using the following property in the `deployment.properties` file:

```
#Enable/Disable the capacitiy check against the selected target while deploying a workload.
com.ibm.cfs.resource.check.enable=true
```

Configuring web user interface

Configuring user interface widgets

The widgets in the web user interface of IBM Cloud Manager with OpenStack and the properties of the widgets are configurable. Using configuration settings, you can control which widgets appear and in what order they appear.

About this task

To configure user interface widgets for IBM Cloud Manager with OpenStack, perform the following steps:

Procedure

1. Open the `web.properties` file in the home directory.
2. Set the `com.ibm.cfs.web.pods.order` property to the names of widgets that are to be shown in the IBM Cloud Manager with OpenStack user interface, in the order you want them displayed. The names are not case-sensitive and must be separated by a comma. Possible names include the following names:
   - **CloudStatus**
   - **WorkloadsStatus**
   - **ResourceUsageStatus**
   - **RecentEvents**
3. Set the properties of each widget. The following example shows a widget property configuration example using the CloudStatus widget.
   1. `com.ibm.cfs.web.pods.cloudstatus.enabled=true`

      If the value is *true*, the CloudStatus widget is displayed in the IBM Cloud Manager with OpenStack web user interface. If the value is *false*, the property is not specified in the file, or you specify an incorrect value (*truue*) then the CloudStatus widget is not displayed.
   2. `com.ibm.cfs.web.pods.cloudstatus.closed`

      If the value is true, the CloudStatus widget is initially displayed in a collapsed form. Otherwise, the CloudStatus widget is initially expanded in the IBM Cloud Manager with OpenStack web user interface.
   3. `com.ibm.cfs.web.pods.cloudstatus.refresh.interval=30`

      The value of this property indicates how often the CloudStatus widget is refreshed. The value is specified in seconds and must be an integer of 1 or higher.

      Repeat these substeps for each additional named widget to be configured, including WorkloadsStatus, ResourceUsageStatus, and RecentEvents. The following properties can be set:

   WorkloadsStatus:
   - `com.ibm.cfs.web.pods.workloadsstatus.enabled`
   - `com.ibm.cfs.web.pods.workloadsstatus.closed`
   - `com.ibm.cfs.web.pods.workloadsstatus.refresh.interval`

   ResourceUsageStatus
   - `com.ibm.cfs.web.pods.resourceusagestatus.enabled`
   - `com.ibm.cfs.web.pods.resourceusagestatus.closed`
   - `com.ibm.cfs.web.pods.resourceusagestatus.refresh.interval`

   RecentEvents
   - `com.ibm.cfs.web.pods.recentevents.enabled`
   - `com.ibm.cfs.web.pods.recentevents.closed`
   - `com.ibm.cfs.web.pods.recentevents.refresh.interval`

4. Save the `web.properties` file and restart the IBM Cloud Manager with OpenStack server. The properties of each widget take effect after the server is restarted.

   Note:

   - If a widget is not listed in `com.ibm.cfs.web.pods.order` and its property `com.ibm.cfs.web.pods.name.enabled` is set to true, it is displayed in the IBM Cloud Manager with OpenStack user interface after all the widgets specified in the `com.ibm.cfs.web.pods.order` property.
   - If the `web.properties` file does not exist, all user interface widgets show by default.

Configuring session timeout

You can configure how long a web interface session for an IBM Cloud Manager with OpenStack user can remain inactive before the session times out.

About this task

To configure the timeout value, follow these steps:

Procedure

1. Open the `web.properties` file in the home directory.
2. Set the `com.ibm.cfs.client.idle.timeout` property to the number of minutes for which the session is allowed to be inactive. The number must be a positive number and greater than one. After the specified amount of time passes, the user session with IBM Cloud Manager with OpenStack expires.

   If the property is set to `-1`, the user session with IBM Cloud Manager with OpenStack never expires.
3. Save the `web.properties` file and restart the IBM Cloud Manager with OpenStack server. The property takes effect after the server is restarted.

   Note: If `com.ibm.cfs.client.idle.timeout` property is not present or is set to an invalid value, a default value of 30 minutes is used.

Configuring the Welcome page

You can configure IBM Cloud Manager with OpenStack to display the welcome page for all users.

Procedure

1. Open the `web.properties` file in the home directory.
2. To display the welcome page for all users, set the `com.ibm.cfs.web.welcomepage.enabled` property to `true`.
3. Save the `web.properties` file and restart the IBM Cloud Manager with OpenStack server. The property takes effect after the server is restarted.

   Note: If `com.ibm.cfs.web.welcomepage.enabled` property is not present or is set to an invalid value, the welcome page is displayed.

Configuring the default instance name

You can configure IBM Cloud Manager with OpenStack to use a default instance name when deploying an image. If you set this property to true, a default instance name based on the image name that is being deployed is generated; otherwise no default is used.

Procedure

1. Open the `web.properties` file in the home directory.
2. To set the default instance name to the image name being deployed, set the `com.ibm.cfs.web.workloadname.default.enabled` property to `true`.

3. Save the web.properties file and restart the IBM Cloud Manager with OpenStack server. The property takes effect after the server is restarted.

   Note: If com.ibm.cfs.web.workloadname.default.enabled property is not present or is set to an invalid value, the default name is set.

Configuring IBM Cloud Manager with OpenStack dashboard properties

You can configure various web interface properties for the IBM Cloud Manager with OpenStack dashboard.

After you successfully install IBM Cloud Manager with OpenStack, you can customize the IBM Cloud Manager with OpenStack dashboard to manage your cloud. For information about customizing the dashboard settings and configuration, see Horizon Settings and Configuration Documentation.

Rebranding the dashboard

IBM Cloud Manager with OpenStack provides a recipe to customize the branding that is applied to the dashboard.

The branding information must be contained in a compressed file. For example, openstack-branding.tar.gz. The compressed file content is a folder that contains up to three items:

- A file that is named product_name.txt that contains the dashboard name on the first line.
- A folder that is named icons that contains custom icons that override the default icons.
- A folder that is named styles that contains custom style sheets to be applied to the dashboard.

Here is an example branding folder structure:

```
branding
 |-- product_name.txt
 |-- icons
 |    |-- favicon.png
 |    |-- logo.png
 |    |-- logo-splash.png
 |-- styles
 |    |-- custom_1.css
 |    |-- custom_2.scss
```

To create the tar file, put the branding files into a local directory structure as noted above.

1. Change the active directory to the branding directory.
2. Run **cd branding**.
3. Run the tar command: **tar -czf ../openstack-branding.tar.gz ***.
4. Make tar file available to Chef server.
5. Add the **ibm-os-dashboard-branding** role to the end of the run list of the controller node which is running Horizon and is to be re-branded
6. Update the node. See steps in the “Updating a deployed topology” on page 149 topic.

Changing the dashboard name

You can change the dashboard name by providing a product_name.txt file. The first line of this file is used in the page title and displayed on the Login page and in the page header.

Changing Icons

You can change the icons that are displayed in the dashboard by providing custom icons in the icons folder. The content of this folder is copied into the dashboard icons directory, overwriting any existing icons. To override an icon, provide an icon of the same name in the icons folder. You might change the following icons for rebranding purposes:

- `favicon.png`: The favicon image that is displayed in the browser.

  Note: The `favicon.ico` file is not used.
- `logo.png`: The logo that is displayed in the page header.
- `logo-splash.png`: The logo that is displayed on the Login page

The dashboard icons are in `/usr/share/openstack-dashboard/openstack_dashboard/static/dashboard/img`.

Providing Custom Style sheets

You can provide custom style sheets by placing them in the styles folder. The supported style sheet types include SCSS (.scss extension) and CSS (.css extension). Files of any other extension type are ignored. Multiple style sheets are applied in alphanumeric order. For example, a style sheet that is named `custom1.css` is applied before a style sheet named `custom2.css`.

Changing the Custom Branding

You can change or remove any custom branding that is applied to the dashboard by running the dashboard branding recipe again using different branding information. To remove a previously applied customization, omit the customization information from the provided branding folder. For example, to return the icons back to the default, run the branding recipe using a branding folder that does not contain an icons folder. By using an empty branding folder, all customizations are removed.

Chapter 7. Managing IBM Cloud Manager with OpenStack as an Administrator

Use the following information for working with IBM Cloud Manager with OpenStack. The management tasks vary depending on the IBM Cloud Manager with OpenStack role and access level you are using. Select the content that applies below, depending on whether you log in as an *Administrator* or a *User*.

Configuring the license key

The IBM Cloud Manager with OpenStack product includes a default trial license, with a 90-day trial period. You can use this license to investigate IBM Cloud Manager with OpenStack.

About this task

To update the license, follow these steps:

Procedure

1. Copy the `cmwo_4.2.lic` file from the IBM Cloud Manager with OpenStack installation media to the deployment server system.
2. To apply the permanent license, run the following command:

   ```
   /opt/ibm/cmwo/bin/cmwo_lic.sh -a /product_dir/cmwo_4.2.lic
   ```

   where *product_dir* is the directory to which you copied the `cmwo_4.2.lic` file.

Results

If the license is valid, you receive a message that states the update was successful. If it is not valid, you receive a message that states the license is invalid.

Related reference:

"License information" on page 6
Learn about license information for the IBM Cloud Manager with OpenStack product.

Managing IBM Cloud Manager with OpenStack services

Use this information to see which services run in your IBM Cloud Manager with OpenStack topology deployment. Additionally, learn to check the status of services and restart services.

Checking status of OpenStack services

After an IBM Cloud Manager with OpenStack topology is deployed, you can check the status of the IBM Cloud Manager with OpenStack services. You can use the OpenStack Dashboard or issue an IBM Cloud Manager with OpenStack command to check more detailed status.

About this task

To check the services status with OpenStack Dashboard, log in and select **Admin** > **System Panel**.

If you want a more detailed status check of the IBM Cloud Manager with OpenStack services, issue the following command for each node in your topology deployment.

```
$ knife os manage services status ––node your-node-FQDN
```

The status of all IBM Cloud Manager with OpenStack services on the node is displayed.

Alternatively, issue the following command to get detailed status for each node in a known topology by using a topology JSON file:

```
$ knife os manage services status ––topology-file your-topology-name.json
```

The status of all IBM Cloud Manager with OpenStack services on all of the nodes is displayed.

Restarting IBM Cloud Manager with OpenStack services

If you need to restart services for IBM Cloud Manager with OpenStack, use the IBM Cloud Manager with OpenStack services command and specify the `restart` action. You can use the command to restart IBM Cloud Manager with OpenStack services on a specific node or on all nodes in a topology.

About this task

To restart the IBM Cloud Manager with OpenStack services, issue the following command for any node in your topology deployment:

```
$ knife os manage services restart ––node your-node-FQDN
```

All IBM Cloud Manager with OpenStack services on the node are restarted.

If you restart an OpenStack controller node, you should also restart the IBM Cloud Manager with OpenStack services on all of the OpenStack compute nodes in the topology. Issue the **`knife os manage services restart`** command for each OpenStack compute node to restart the services on each compute node in the topology.

Alternatively, issue the following command to restart the IBM Cloud Manager with OpenStack services in the proper order for each node in a known topology by using a topology JSON file:

```
$ knife os manage services restart ––topology-file your-topology-name.json
```

All IBM Cloud Manager with OpenStack services on all nodes in the topology are restarted in the proper order.

Related concepts:

"Updating a deployed topology" on page 149
After you deploy a topology, you might need to apply fixes, either to the IBM Cloud Manager with OpenStack services themselves or to how the IBM Cloud Manager with OpenStack services are deployed.

IBM Cloud Manager with OpenStack services

The IBM Cloud Manager with OpenStack services provided throughout your topology deployment are determined by the roles that are defined for each node.

Overview

The following lists detail the services that are provided by each role. The services are listed in their start order. If you stop services, you must stop the services in reverse order. If you need to restart database services, then all services on the OpenStack controller node must be stopped before the database services can be restarted. In addition, if you need to restart the Qpid (or RabbitMQ) messaging service, then the services running on the OpenStack compute nodes must also be restarted.

Note: Nodes that have the Hyper-V agent installed are not assigned a role. For more information about managing the IBM Cloud Manager with OpenStack services that are running on Hyper-V agent nodes, see Installing and uninstalling the IBM Cloud Manager with OpenStack Hyper-V Agent.

The following roles run the same services as other roles that are described in detail below.

ibm-os-allinone-kvm
: Runs the same services as the **ibm-os-single-controller-node** role followed by the **ibm-os-compute-node-kvm** role.

ibm-os-single-controller-node
: Runs the same services as the **ibm-os-database-server-node** and **ibm-os-messaging-server-node** roles followed by the **ibm-os-single-controller-distributed-database-node** role.

ibm-os-single-controller-powervc-driver
: Runs the same services as the **ibm-os-single-controller-node** role followed by the **ibm-os-powervc-driver-node** role.

ibm-os-single-controller-distributed-database-node

```
memcached
openstack-keystone
openstack-iaasgateway
openstack-glance-api
openstack-glance-registry
neutron-server
neutron-openvswitch-agent
neutron-dhcp-agent
neutron-lbaas-agent
neutron-l3-agent
neutron-vpn-agent
openstack-nova-conductor
openstack-nova-api
openstack-nova-scheduler
openstack-nova-cert
openstack-nova-novncproxy
openstack-nova-consoleauth
openstack-cinder-volume
openstack-cinder-api
openstack-cinder-scheduler
openstack-heat-api
openstack-heat-api-cfn
openstack-heat-api-cloudwatch
openstack-heat-engine
openstack-ceilometer-api
openstack-ceilometer-central
openstack-ceilometer-collector
openstack-ceilometer-notification
openstack-ceilometer-alarm-evaluator
openstack-ceilometer-alarm-notifier
httpd
```

Note:

- The `neutron-l3-agent` service is only present if the Neutron L3 agent setting is enabled with the environment override attribute **ibm-openstack.network.l3.enable = true** and the VPN setting is disabled with the environment override attribute **openstack.network.enable_vpn = false**.
- The `neutron-vpn-agent` service is only present if the VPN setting is enabled with the environment override attribute **openstack.network.enable_vpn = true**.

ibm-os-compute-node-kvm

```
neutron-openvswitch-agent
openstack-nova-compute
openstack-ceilometer-compute
```

ibm-os-compute-node-powerkvm

Runs the same services as the **ibm-os-compute-node-kvm** role.

ibm-os-zvm-driver-node

```
neutron-zvm-agent-*
openstack-nova-compute-*
```

Note: *neutron-zvm-agent-** stands for all Neutron z/VM agent services that have the prefix *neutron-zvm-agent-*. Each Neutron z/VM agent service is named *neutron-zvm-agent-#{host}*, and each **#{host}** corresponds to its attribute *ibm-openstack.zvm-driver.#{host}* that is set by **ibm-openstack.zvm-driver.hosts** in Chef.

*openstack-nova-compute-** stands for all Nova compute services that have the prefix *openstack-nova-compute-*. Each Nova compute service is named *openstack-nova-compute-#{host}*, and each **#{host}** corresponds to its attribute *ibm-openstack.zvm-driver.#{host}* that is set by **ibm-openstack.zvm-driver.hosts** in Chef.

ibm-os-powervc-driver-node

```
openstack-glance-powervc
openstack-cinder-powervc
openstack-neutron-powervc
openstack-nova-powervc
```

ibm-os-database-server-node

```
# When DB2 database is used.
db2.service
db2.nosql.service

# When MySQL database is used:
mysqld
```

ibm-os-messaging-server-node

```
# When Qpid messaging service is used:
qpidd

# When RabbitMQ messaging service is used:
rabbitmq-server
```

ibm-sce-node

```
sce
```

ibm-os-prs-ego-master

```
ego
```

ibm-os-prs-controller-node

```
openstack-nova-ibm-notification
openstack-nova-ibm-ego-resource-optimization
openstack-nova-ibm-ego-ha-service
```

ibm-os-block-storage-node

```
openstack-ceilometer-compute
openstack-cinder-volume
tgtd
```

Related reference:

"Roles" on page 287
The following roles are provided in support of the reference topologies.

Managing with the IBM Cloud Manager with OpenStack self-service portal (Administrator access)

With the Administrator role in the IBM Cloud Manager with OpenStack self-service portal, you perform tasks such as configuring clouds, creating projects, and managing images, instances, and requests.

For information about using the self-service portal as a non-administrative user, see the **Managing as a User (self-service portal)** section.

Starting and stopping IBM Cloud Manager with OpenStack self-service portal

The following steps are required for starting IBM Cloud Manager with OpenStack self-service portal.

Note: When you start or restart the self-service portal on a high scale cloud, the synchronization between the self-service portal and the cloud might take longer than expected. This resynchronization might cause operations such as deploying, deleting, or resizing an instance to be delayed or even fail. Wait for the synchronization to complete before you attempt these actions.

Starting and stopping IBM Cloud Manager with OpenStack self-service portal on Linux

The IBM Cloud Manager with OpenStack self-service portal installation on Linux can be started by the root user or by users who are members of the sce group.

After the self-service portal on Linux is installed, the self-service portal service is started. You can check the self-service portal status on your controller node with the `service sce status` command.

Use the following commands to start, stop, and restart the self-service portal service on Linux:

- Start the self-service portal: `service sce start`
- Stop the self-service portal: `service sce stop`
- Restart the self-service portal: `service sce restart`

Access the self-service portal user interface by opening `https://localhost:18443/cloud/web/index.html` in a supported browser.

Note: The host name *localhost* and port *18443* are the default host and port names. Substitute the appropriate values for your environment if necessary.

Configuring the default administrator user account and changing password

The default administrator account is created the first time the IBM Cloud Manager with OpenStack self-service portal is started. As administrator, configure the default administrator user account to receive email and notification from users.

About this task

To modify the default administrator user account, follow these steps:

Procedure

1. In the self-service portal, log in as the cloud administrator.
2. Select **Cloud Administrator** in the upper right title bar of the screen, and click **Show user preferences**.

3. On the User Profile dialog, enter the administrator email address.
4. Check **Send notifications about instances and other events**.
5. Verify the **Timezone** and **Language** for the administrator.
6. To change the Cloud Administrator password, click **Change Password**.
7. Click **Update.**

Configuring LDAP authentication using the web interface

Use the web interface to configure IBM Cloud Manager with OpenStack self-service portal as an LDAP client.

Procedure

1. Log in to the self-service portal as an administrator.
2. Click the **Configuration** tab and select **LDAP** in the navigation pane.
3. Click **Edit** and enter the configuration settings to specify how to connect to the LDAP host.

   LDAP provider hostname
   The fully qualified server host name or IP address of the LDAP host.

   Port The port number of the LDAP service on the host for either transaction level security (TLS) or for no security protocol. The default port number is 389.

   Security Protocol
   The self-service portal allows transaction level security (TLS) to be used.

   Certificate
   If transaction level security is used, you must provide the certificate (public key) used by the LDAP server for securing the connection. For information about obtaining a certificate, see your LDAP server documentation.

   LDAP search DN
   This is the distinguished name that should be used to connect to the LDAP host to perform a directory search, for example cn=Administrator,cn=users,dc=cfs1,dc=us

   Note: This field might be required based on the configuration of the LDAP server. For example, if the LDAP server does not support anonymous bind, or if you specify transaction level security (TLS) for the Security Protocol, this field is required. If the LDAP search DN is required, the ID must have read authority on the LDAP server.

   Password
   This is the password that is associated with the LDAP search DN.

   Note: This field is required if the LDAP search DN is required.

   Search filter
   This is the filter that is used to authenticate users when they log in. Include the special value {FILTER} in the filter to specify where the user ID that is provided during the login should be substituted. For example, (|(userPrincipalName={FILTER}))

   Search context
   The search context for providing the LDAP lookup.

   User ID attribute
   The name of the LDAP field to use as the user ID in the self-service portal.

   User name attribute
   The name of the LDAP field to use as the user name in the self-service portal.

   Email address attribute
   The name of the LDAP field to use as the email address in the self-service portal.

4. Click **Save**.
5. Restart the self-service portal service for the settings to take effect.

Example

The following examples show settings for different connections:

- **Example 1: Non secure connection (transaction level security is disabled)**

  LDAP provider hostname
  your.host.com.

  Port 389

  Security Protocol
  None

  LDAP search DN
  cn=Manager,dc=sce,dc=com

  Password
  password

  Search filter
  (|(cn={FILTER}))

  Search context
  ou=People,dc=sce-svt,dc=com

  User ID attribute
  uid

  Username attribute
  cn

  Email addressattribute
  mail

- **Example 2: Transaction level security is enabled**

  LDAP provider hostname
  your.host.com.

  Port 389

  Security Protocol
  Transaction level security (TLS)

  Certificate
  certificate_file.cer

  LDAP search DN
  cn=Manager,dc=sce,dc=com

  Password
  password

  Search filter
  (|(cn={FILTER}))

  Search context
  ou=People,dc=sce-svt,dc=com

  User ID attribute
  uid

Username attribute
cn

Email addressattribute
mail

What to do next

Notes:

- The self-service portal cannot be returned to use local authentication (non-LDAP authentication) through the web interface. If it is necessary to restore local authentication, see Configuring local authentication for more information. Local authentication is intended only for non-production environments such as for a proof of concept or for performing a demo.
- If you want to enable user name case sensitivity, you must update the `ldap.xml` file after setting the initial LDAP configuration in the web interface. For more information, see “Configuring LDAP authentication manually” on page 166 for more information.

Managing images

In the **Images** tab, you can manage and configure the images that are available for deployment. You can view image properties and deploy images.

In IBM Cloud Manager with OpenStack, each image has a status that is associated with it. If the status is *OK*, then the image is ready to be deployed. Click the refresh arrow to update the status.

To view the properties of an image, click the name of the image.

If the list of images does not contain the image that you want, ensure that the current cloud, project, and architecture filters are set correctly.

Building images

Building images manually is a complex and error-prone process. By pre-building images from specific software bundles for reuse by others, administrators can streamline this process. There are several different ways of building images.

Building images with VMware Studio
VMware Studio and the OVF Toolkit simplify the process of image creation. The images that are created in VMware Studio can be imported and deployed by using vSphere Client. For more information about using VMware Studio, see VMware Studio Documentation at http://www.vmware.com/support/developer/studio/.

Building images manually
You can choose to build images manually using open source tools. This method requires significant virtualization and image configuration (for example, OVF, Sysprep or cloud-init) experience.

For more information about creating OpenStack compatible images, see Create images manually in the OpenStack documentation.

Importing images (OpenStack only)

Using IBM Cloud Manager with OpenStack, you can import images to an OpenStack cloud.

About this task

You can use existing OpenStack compatible images. For more information about creating OpenStack compatible images, see Create images manually in the OpenStack documentation.

IBM Cloud Manager with OpenStack supports OpenStack images with the following disk formats supported by different hypervisor types.

Table 58. Supported disk formats by hypervisor

Disk Format	Hyper-V	KVM	PowerKVM	PowerVC	Details
VHD	Y	N	N	N	Microsoft virtual hard disk format
RAW	N	Y	Y	Y	Raw virtual machine disk format
QCOW2	N	Y	Y	N	QEMU disk format
VMDK	N	Y	N	N	VMware virtual machine disk format
AMI/AKI/ARI	N	Y	N	N	Amazon machine/kernel/ramdisk disk format
ISO	N	N	N	N	Disk format with an optical disk file system
VDI	N	N	N	N	Virtual desktop infrastructure disk format

IBM Cloud Manager with OpenStack supports OpenStack images for one of the following guest operating systems:

Table 59. Supported guest operating systems by hypervisor

Guest operating system	Hyper-V	KVM	PowerKVM	PowerVC	VMware	z/VM
Windows • Windows 8 • Windows 7 • Windows Server 2012 R2	Y	Y	N	N	Y	N
Linux • Red Hat Enterprise Linux 6.5 • SUSE Linux Enterprise Server 11.2	Y	Y	N	N	Y	N

Table 59. Supported guest operating systems by hypervisor (continued)

Guest operating system	Hyper-V	KVM	PowerKVM	PowerVC	VMware	z/VM
Linux on Power • Red Hat Enterprise Linux 5.9 • Red Hat Enterprise Linux 6.5 • SUSE Linux Enterprise Server 11 SP3 • SUSE Linux Enterprise Server 12 LE (PowerKVM 2.1.1 only)	N	N	Y SUSE Linux Enterprise Server 12 LE (PowerKVM 2.1.1 only)	Y	N	N
Linux on IBM System z • Red Hat Enterprise Linux 6.5 • SUSE Linux Enterprise Server 11.2	N	N	N	N	N	Y
AIX • AIX 6.1, TL 9 • AIX 7.1, TL 3	N	N	N	Y	N	N
IBM i	N	N	N	N	N	N
Ubuntu • Ubuntu 12.10 • Ubuntu 13.10 • Ubuntu 14.04 LE	Y (Ubuntu 12.10 only)	Y (Ubuntu 12.10 only)	Y (Ubuntu 14.04 LE only)	N	Y (Ubuntu 13.10 only)	N

Notes:

- The imported image file is stored in the OpenStack cloud and not in the IBM Cloud Manager with OpenStack database.
- An image with the VMDK disk format must have its disk that is contained in a single VMDK file.
- IBM Cloud Manager with OpenStack does not support directly deploying images with the AKI and ARI disk formats. Such images are deployed with an AMI disk formatted image. As a result, images with the AKI and ARI disk formats have an Undeployable state in IBM Cloud Manager with OpenStack.

- IBM Cloud Manager with OpenStack does not support importing images for deployment to PowerVC. Only the PowerVC images that were synchronized into the OpenStack cloud and made available to IBM Cloud Manager with OpenStack can be deployed to PowerVC. For information about working with PowerVC images, see the IBM Power Virtualization Center Standard information center:

  http://www.ibm.com/support/knowledgecenter/SSXK2N_1.2.1/com.ibm.powervc.standard.help.doc/powervc_images_hmc.html.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, click the **Images** tab.
2. Click **More** and choose **Import image...** from the menu to open the Import Image window.
3. Update the cloud, project, image name, disk format, and container format for the image being imported.

   Note: When the AMI disk format is selected, you can select the associated AKI (kernel image) and ARI (ramdisk image) disk formatted images. If these images have not been imported, then you can edit these image properties later.
4. Update the hypervisor type for the image being imported. The hypervisor type might have a default value set based on the disk format selected. If the image does not have a specific hypervisor type requirement, then select the “Not Specified” option. If a specific hypervisor type is selected and there is no hypervisor in the OpenStack cloud that has a matching type, the image is not deployable.
5. Optional: If the image has a minimum memory or storage size requirement, update the **minimum memory (MB)** and **minimum storage (GB)** fields.

   Note: By default, OpenStack uses the size of the image as the minimum storage size requirement when deploying the image. This default is often sufficient. However, if the image uses a compressed disk format, such as QCOW2, then the minimum storage size requirement should be set to the decompressed image size.
6. Optional: If the image has specific OpenStack architecture requirements, update the architecture fields.
7. Click **Import**.

   Note: When you upload an image file using some older browser versions, space for the image file is required in the server `temp` directory. This temporary file is deleted when the upload completes. If the upload does not complete successfully, it is possible that the temporary file is not deleted automatically. If you must use an older browser, place the image file in a location where it can be imported using a URL.

Results

After the image is successfully imported, you can edit a subset of the image properties. For more information on editing OpenStack image properties, see Editing image properties (OpenStack only).

If an image is not deployable after it is imported, check the log entries for the image for more information. You might must modify the image properties to make the image deployable.

Related reference:

Building images
This topic contains more information about building images.

Related information:

Getting virtual machine images
This site contains example images that are compatible with OpenStack.

Editing image properties (OpenStack only)

IBM Cloud Manager with OpenStack supports viewing and editing a subset of the properties that are stored with an image in the OpenStack cloud.

Procedure

1. In the IBM Cloud Manager with OpenStack web interface, click an image to view or edit the properties of that image.
2. The following basic OpenStack image properties can be edited: name, disk format, container format, minimum memory (MB), and minimum storage (GB).
3. Optional: You can also view, create, update, and delete additional OpenStack image properties. The additional properties might include architecture, hypervisor_type, kernel_id, ramdisk_id, os_version or os_distro. For more information about OpenStack image properties, see the OpenStack Compute Administration Guide at http://docs.openstack.org/admin-guide-cloud/content/section_image-mgmt.html.

   Some of the additional OpenStack image properties are specific to certain OpenStack hypervisor types. For example, the KVM hypervisor supports the hw_vif_model, hw_disk_bus and hw_cdrom_bus properties. For more information about these properties, see Libvirt Custom Hardware Configuration at https://wiki.openstack.org/wiki/LibvirtCustomHardware.

   Notes:

   - An image configuration strategy is part of the additional OpenStack image properties. However, the configuration strategy cannot be viewed or edited with this task.
   - To deploy an image to an OpenStack KVM hypervisor, the **qemu** value is used for the hypervisor_type property of the image.

Updating an image configuration strategy (OpenStack only)

IBM Cloud Manager with OpenStack supports adding, updating, and deleting the configuration strategy for an image in an OpenStack cloud.

About this task

The configuration strategy is stored with the image in the OpenStack cloud.

Procedure

1. Select the image that you want to update.
2. Click **More** and choose **Configuration Strategy...** from the menu.
3. Click **Edit**.

   Note: If a configuration strategy exists, a Delete button is provided to delete the existing configuration strategy. The Edit button can be used to add or update the configuration strategy.
4. Update the configuration strategy type, template, user metadata, and mapping for the image.
5. Click **Save**.

   Note: After you update the configuration strategy, reset the image configuration in order for the updated configuration strategy to be applied when you configure or deploy the image.

Related tasks:

"Configuring images with OpenStack" on page 184
The following topics cover information to configure images in an OpenStack environment.

Creating a VMware linked virtual machine

Linked virtual machines can be created from a snapshot or from the current running point. A linked clone is a virtual machine whose disks are linked with the template that it was cloned from. Duplicated data is shared between the linked virtual machine and the template. Linked clones deploy much faster because most of the disk data does not have to be copied.

About this task

You can use any image (or template) to create a linked virtual clone. To create a linked virtual clone, follow these steps:

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Images**.
2. Select the image that you want to clone and select **Deploy** > **Advanced**.
3. On the Advanced Deployment window, select the option to **Link virtual machine to image**.

What to do next

Note:

- The creation of a linked clone requires the image to contain a virtual machine snapshot. If the image used to create a linked clone does not have a virtual machine snapshot, IBM Cloud Manager with OpenStack creates a virtual machine snapshot for the image before the linked clone is created.
- If an image already has a virtual machine snapshot, IBM Cloud Manager with OpenStack does not create a new snapshot, but instead uses the current snapshot. Changes that are made to the template might not be reflected, since the clone operation is based on the snapshot and any future changes you make are outside of the snapshot If you must change the template, create a new snapshot that includes your changes.
- Storage DRS supports linked clones starting in VMware vSphere version 5.1. However, Storage DRS is not always able to make a recommendation to place linked clones on a datastore. As a result, an attempt to deploy a linked clone to a storage DRS cluster results in the creation of a full clone, and a warning message in the log that a linked clone was not created.
- The disks of a linked clone cannot be resized. Any attempt to resize a linked disk at deployment time results in an error.
- The datastores of the image must be accessible by the deployment target or the virtual machine cannot be linked to the image. In this case, IBM Cloud Manager with OpenStack deploys a full clone.
- You cannot unlink a linked clone from the image.

Configuring image deployment properties

Image deployment customization properties that you want to apply to individual images must be configured through the IBM Cloud Manager with OpenStack web user interface. IBM Cloud Manager with OpenStack enables you to save these properties in advance so that your users do not have to know all the internal and advanced deployment details.

About this task

To set global image deployment properties, see “Configuring global image deployment” on page 173.

The values that are set in the global image deployment properties are used when deploying an image unless individual deployment properties are set for an image. The values that are set for an individual image are used unless they are explicitly overridden when deploying an image. Administrators can set which values are displayed in the basic deployment or even allow users to set advanced deployment properties. For more information about allowing users to view advanced form, see “Configuring access to advanced deployment form” on page 175.

Note: Global configurations are refreshed only when manually reset or when the deployment target changes.

To configure image default deployment customization properties to be used when deploying it from IBM Cloud Manager with OpenStack, complete the following steps:

Procedure

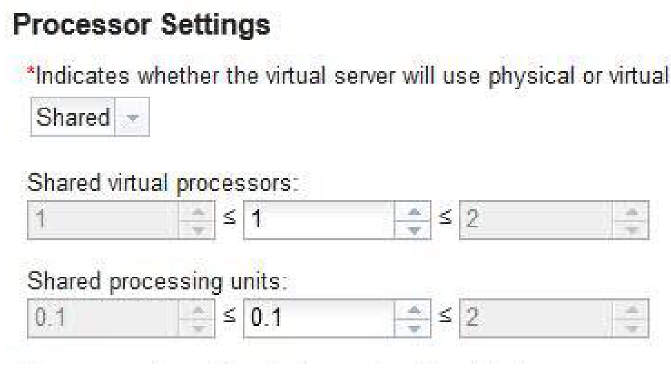
1. In the IBM Cloud Manager with OpenStack interface, click the **Images** tab.
2. Click the name of the image that you want to configure.

   Note: If the image that you want is not available, make sure that the correct cloud, architecture, and project are specified.
3. Click **Configure**.
4. Complete the default customization for the image properties. These properties are divided into several groups, including: Hardware, Software, Network, Storage, Image Target and Other Settings, depending on the type of image that you select.

   Note: Changes that were made in the cloud since the image was added, such as networks that were created or removed, might not display on the Configure Image panel. To ensure that the current cloud settings are available to configure the image, click **Reset to Defaults**.
   - Hardware

     Notes:
     - For OpenStack you can control the size of the virtual machine that is deployed from an image by the flavor that you select. Only flavors that meet the disk and memory size requirements for the image are listed as options.
     - For Power Systems that are running in shared mode, the minimum, desired, and maximum number of both shared virtual processors and shared processing units are paired. For each paired value, take care to ensure that values are set correctly. The number of processing units must be less than or equal to the number of virtual processors. However, the processing units, multiplied by 10, must be greater than or equal to the number of virtual processors.

       For example, if the minimum number of virtual processors is 1, then the minimum number of processing units must be less than or equal to 1 (between 0.1 and 1), and must also be greater than or equal to 1 when it is multiplied by 10.



Processor Settings

*Indicates whether the virtual server will use physical or virtual processors (dedicated or shared mode).:

Shared

Shared virtual processors:

1 ≤ 1 ≤ 2

Shared processing units:

0.1 ≤ 0.1 ≤ 2

Figure 3. Processor settings

   - Software
   - Network

     Notes:
     - You can click **Show settings** for each network configuration setting to display configurable options. For Power Systems, VLAN configuration is available in the Adapter network configuration section. (For OpenStack images, **Show settings** is not shown or valid.)
     - The *NONE* value indicates that no network configuration is applied to the settings, in which case the values should be entered manually. (For OpenStack images, *NONE* is not shown or valid.)

- When a network configuration (including *NONE*) is selected for use, all settings in the subsection are cleared, indicating they draw from the configuration specified.
- When a network configuration is applied, individual settings can be specified manually by providing a value for the setting and therefore overriding the setting that is specified in the network configuration. Any settings that are blank are taken from the configuration settings. (For OpenStack networks, individual network settings cannot be specified.)

- Storage

  Notes:

  a. The `Virtual disk options for an add disk request` option is for adding a disk during the image deployment and is specific to a VMware cloud. This option is an ordered and colon-separated list of virtual disk options. The default value for an optional virtual disk option is an empty string. The options are parsed in the following order:

     Disk size in MB (Required)
     This option is parsed as a long.

     Thin provisioned (Optional)
     This option is parsed as a boolean. The default value is false which specifies thick provisioned status.

     Eagerly scrub (Optional)
     This option is parsed as a boolean. The default value is false which specifies that the underlying file system determines the scrub status.

     Datastore (Optional)
     This option is parsed as a string. The default value is null which specifies that you want to use the same datastore as the datastore that is used by the main disk of the virtual machine. Input value sample:

     The following is an example of this option:

     ```
     1:true:false:datastore_01
     ```

  b. To configure the maximum number of disks that are allowed or the maximum size of the disks, see "Configuring the number and maximum size of additional storage" on page 176.

- Image target
- Other Settings

5. Depending on the image, you might be able to enter the root password for the server that is provisioned by this image, such that users that deploy the image receive the root password in an email notification.
6. Optionally, you can select specific image customization properties to display to a user on the basic deployment form.
   a. Select the **Show basic deploy panel settings** check box at the top of the configuration panel.
   b. For individual customization properties, select the associated **Show in basic deploy settings** check box. This option causes the property to be displayed when a user brings up the basic deployment form for this image. Check only those properties that you want a user to customize, for example, passwords or port numbers for a specific software product included in the image.
7. Select **Save**.

   Note: You can reset an image customization to its original configuration by clicking **Reset to Defaults**.

Deploying an image

You can deploy an image with either basic configuration options or advanced configuration options. Advanced configuration options are only available if the administrator enables them for your environment.

Procedure

1. Click the name of the image you want to deploy.
2. In the Image Details properties page, click **Deploy**.

   Note: The IBM Cloud Manager with OpenStack cloud administrator can configure IBM Cloud Manager with OpenStack to allow users to use the advanced deployment form when deploying an image. Click **More** > **Advanced deploy** to display the advanced deployment form.

   Basic deployment

   With a basic deployment, minimal configuration options, including name, description, project, flavors (if you are using OpenStack), processor information, memory, and key pairs (if you are using OpenStack and at least one key pair is configured for the user) are displayed.

   Advanced deployment

   Administrator Advanced deployment makes a number of different settings available when an image is deployed. For example, with advanced deployment a user can configure setting like networking, storage, and software configuration values. To enable access to these functions, you can do one of the following:

   - Make the advanced deployment form available to all users.
   - Choose specific values for an image by selecting the corresponding check box and exposing that on the basic deployment.

   For more information about enabling advanced deployment options for users, see "Configuring image deployment properties" on page 219.

   With advanced deployment, administrators can configure the options, so users can suspend and resume instances. The VMware and OpenStack Linux Kernel-based Virtual Machine (KVM) and Hyper-V environments support the suspend action by default.

   If you enable the multiple instances on a single deployment operation, users can deploy multiple instances through a single deployment. The deployed instances use the deployment name as the prefix of each single instance. The new names also use `-x` as the suffix, where `x` is the index of that instance.

   If the deployment approval process is enabled, you receive a single approval request. You can change the number of deployment instances while you review the request. The metering and billing functions remain for each of the single deployment instances. When deploying multiple instances on a single deployment, the instances of this deployment are not displayed immediately after you click **Deploy** or **Approve**.

   You can also set fields, such as **Virtual Machine Customization**, **Virtual Machine Personality Files**, and more.

   Note:

   - Only the members of the selected project can see the instance that is created as a result of the image deployment.
   - If approvals are enabled, deployment does not begin until the request is approved by the administrator.
   - If billing is enabled, you must be a member of an account that is not delinquent for the deployment to proceed.
   - The expiration period and approvals policy settings for deployment depends on the policies that are set for the cloud. If more detailed expiration and approvals are set for the project where the image is being deployed, the policies for the project are applied.
   - If you are deploying multiple instances, IBM Cloud Manager with OpenStack deploys the instances one by one. If you restart IBM Cloud Manager with OpenStack before all the deployments are complete, the deployments that are not started will not be deployed. For example, if there are five

instances to be deployed and three of them are complete and one is in progress when IBM Cloud Manager with OpenStack is restarted, the fourth instance will be deployed, but the fifth instance will not be deployed.

- If you are deploying an image on z/VM through OpenStack, the instance must have at least one network configuration assigned to the management network. This is because the Extreme Cloud Administration Toolkit (xCAT) is in the management network and the instance must be in the same network as the xCAT, or the deployment will fail.

  Use the Advanced Deploy option and select the first network configuration that is displayed in the IBM Cloud Manager with OpenStack user interface for the management network.

Copying image definitions

Rather than copy an entire image, you can create image copies by using just the metadata of the image.

About this task

By copying the metadata, you can make the same image available to multiple projects or provide multiple alternative configurations of the same base image. You can use the Configure Image window to modify various configuration settings for the copies. The copy image function is enabled for administrators and for project owners for images within their project.

When you copy an image definition, only the image metadata that is stored in the IBM Cloud Manager with OpenStack database is copied. As a result, any metadata that is stored with the image in the cloud is common across the base and copied images. For example, the configuration strategy for an OpenStack image is metadata that is stored with the image in the cloud. Therefore, the same configuration strategy is used for the base and copied images. For more information about OpenStack configuration strategies, see Configuration strategies.

Note: If you delete the base image, then all copied image configurations are also deleted.

To copy an image definition, perform the following steps:

Procedure

1. On the IBM Cloud Manager with OpenStack page, click the **Images** tab.
2. On the Images page, click the base image name that you want to copy.
3. Click **Copy** to enter the image name and description that you want to assign to the copied image.

What to do next

Now you can configure the copied image and move it to different project if desired.

Viewing image properties

You can view image properties such as the image name, description, last modification date, specification version, revision comments, and logs. As an administrator, or if you have project owner authority, you can also make copies of the image, view related images (images that share the same base image), and modify the image name, description, and project.

About this task

Click the image to view or edit the details of that image. Remember that modifications that you make to an image in IBM Cloud Manager with OpenStack might not be reflected in the underlying virtualization infrastructure.

Deleting images

Using IBM Cloud Manager with OpenStack you can delete images from an OpenStack cloud and certain images from VMware clouds.

About this task

When you delete an image, it is deleted from IBM Cloud Manager with OpenStack. The image is deleted from the OpenStack cloud if it is a OpenStack base image.

The ability to delete an image varies by cloud type:

- OpenStack images can be deleted at any time. Deleting an OpenStack base image results in all of its related images, or copied images, being deleted as well.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, click **Images**.
2. Select the image that you want to delete.
3. Click the delete icon.

Managing projects

You can create, manage, and request access to projects on the **Projects** page, which is available on the **Access** tab.

Projects are used to define the users that have access to a set of images and instances. Only members of a project can view images and instance within a project. In many cases, projects correspond to a department or other human organization.

To manage projects, go to the **Access** tab and click **Projects** to view the list of available projects.

IBM Cloud Manager with OpenStack self-service portal comes with a default project called the Public project, to which all users belong. All virtual images and instances created outside of the self-service portal are, by default, assigned to the Public project. You can also configure a staging project to store newly discovered images or instances. The staging project allows administrators to configure images before making them available to other users. For more information, see “Configuring a staging project” on page 175.

Overview of project membership roles

When you are added as a member of a project, one of three membership roles are assigned to you.

Owner
A project owner has administrator authority to the project and its contents. The project owner primarily manages the contents of the project and who has authority to the project and its contents.

User
A project user has the authority to use the project and the objects within the project. For example, a project user can deploy a virtual image to the project. A user can also view and potentially restore backup images of virtual machines that are created by other users, depending on how the project and roles were initially set up. The project user primarily handles their own deployments.

Viewer
A project viewer has authority only to view the project and the virtual images and instances that are contained in the project.

Creating a project

If you are given authority by your administrator, you can create projects.

Before you begin

Discuss your authority level with your administrator. The com.ibm.cfs.project.creation.by.user property in the `deployment.properties` file must be set to True for you to create projects.

Procedure

1. Click **New Project**.
2. Type a project name and description in the corresponding fields.
3. Click **Create**.

Editing project properties

If you have project owner authority, you can edit the properties of an existing project, including project roles, project name, or project membership.

Procedure

1. From the list of projects, select the project you want to edit.
2. To update the project name or description, click the text field and type the new values.
3. To update project membership:
   a. Click **Project Members** to open the panel.
   b. In the Add Project Members window, select the new members and their project roles to add them to the project.
   c. Click **OK**.
   d. To modify an existing member's project role, select the users you want to modify and click **Set Role to** to select the new project role.
   e. To remove members from the project, select the users you want to remove and then click **Remove** to remove the users from the project.
4. To update the expiration policies:
   a. Click **Expiration Policies** to open the panel.
   b. Choose one of the following to set the expiration policy:

      Use cloud default
      The expiration of the deployment will depend on the expiration configuration of the cloud to which the image belongs.

      Customize settings
      The expiration policy you set on this panel (by setting the **Maximum expiration value** and **Maximum extension period** values) overrides the expiration policy of the cloud to which the image belongs.
5. To update the approval policies:
   a. Click **Approval Policies** to open the panel.
   b. Choose one of the following to set the approval policy:

      Use cloud default
      The project uses the approval policy of cloud groups.

      Customize settings
      The project uses the approval policy you set on this panel (by selecting checkboxes from the **Require approval for the following events** list) overrides the approval policy of the cloud groups.
6. Click **Save**.

Setting project policies

For projects that you own, you can set expiration policies and approval policies that affect the instances that are deployed in that project.

Procedure

1. Click the **Access** tab and then the **Projects** tab.
2. Click the name of the project in the table to display the project properties.

3. Click **Edit**.
4. Expand the title of the item you want to work with: **Expiration Policies** or **Approval Policies**.
5. Set your policies for your projects, or select **Use cloud default** to use the policies set by your administrator.

What to do next

For more information about expiration policies and approval policies, see the IBM Cloud Manager with OpenStack Administrators Guide.

Deleting an existing project

As a project owner, you can delete a project at any time.

About this task

When a project is deleted from IBM Cloud Manager with OpenStack, all of the virtual images and instances contained in the project are transferred to the public project.

Procedure

1. In the projects list, select the project you want to delete.

   Restriction: You cannot delete the default Public project.
2. Click the **Delete selected projects** icon.

Project management with OpenStack

Unlike other cloud types, OpenStack clouds provide native support for project management through the OpenStack keystone component. Because the projects are managed in OpenStack, the projects cannot be updated unless the OpenStack cloud is available.

Keystone is an OpenStack component that provides identity, token, catalog, and policy services to projects in the OpenStack family. Upon first connecting to an OpenStack cloud, IBM Cloud Manager with OpenStack self-service portal imports all the projects that currently exist inOpenStack. The current project membership is accepted and reflected in the self-service portal.

After the initial OpenStack projects import, when connected to an OpenStack cloud, the self-service portal enters transactional mode for project management. When in transactional mode, all project management operations that are performed in the self-service portal are also performed in OpenStack (that is in keystone). If a project management operation (or any of the operations described in this section) fails to complete successfully in the self-service portal it does not occur in OpenStack. Likewise, if it fails in OpenStack, it reverts in IBM Cloud Manager with OpenStack self-service portal.

IBM Cloud Manager with OpenStack enters transactional mode for project operations, while connected to OpenStack, in order to have the registries in both products synchronized. For this reason, when connected to an OpenStack cloud, IBM Cloud Manager with OpenStack cannot perform project-related operations while the OpenStack cloud is down or unavailable. In addition, the projects created using Keystone are only synchronized when the self-service portal is restarted. This cannot be done manually from the self-service portal.

The project name changes, membership changes, and project description changes made using Keystone are also only synchronized when the self-service portal is restarted. If you cannot restart the self-service portal, these changes must be made manually from the self-service portal.

Restriction: If the project is deleted directly using Keystone, you also must delete this project manually from the self-service portal after the self-service portal is restarted. You are not allowed to change the name or delete the `Public` project using Keystone. Only membership changes and project description changes can be modified in the `Public` project directly using Keystone.

To connect to OpenStack, the IBM Cloud Manager with OpenStack self-service portal uses a service user account and a default service tenant. Some OpenStack installations have user accounts specific to OpenStack components (for example, nova, keystone, neutron). These and other service user accounts or service tenants in an OpenStack server that do not represent an actual user account or tenant, can be added to the list of service users and service tenants. By doing so, they are ignored by the self-service portal and those service users are not allowed to log into the self-service portal. To make this change, add the service users and tenants to the comma-separated list of users in the *com.ibm.cfs.cloud.openstack.service.users* property, or the comma-separated list of tenants in the *com.ibm.cfs.cloud.openstack.service.tenants* property, in the *openstack.properties* file.

Managing approval policies

IBM Cloud Manager with OpenStack self-service portal administrators can enable approval policy support by specifying the operations that require approval. If approval policies are enabled, the requested operation is held until the approval request is processed by the administrator.

This approval requirement ensures that self-service portal administrators control the self-service portal instance process and provides an audit trail of the requester and approver roles.

From a user standpoint, the approval lifecycle behaves similar to the following:

- Users can see only requests that they initiate.
- Users are unable to view any requests against an instance in the public project that they did not originate. Instances indicate that they are in a Pending state, but users cannot see the outstanding requests that are initiated by other users against that instance.

Setting or modifying approval policies for a cloud

Follow these steps to set or modify an approval policy for a cloud. These policies are used unless they are overridden by an approval policy for a project.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Configuration** > **Clouds**.
2. Click the cloud name for which you want to modify approval policies.
3. Select **Approval Policies**.
4. Set the events that require administrator approval.

   Deploying an image

   Approval policy that is invoked when deploying an image to create an instance in the cloud. This approval policy suspends the deployment operation until the generated request is approved or rejected.

   Extending the instance expiration time frame

   Approval policy that is invoked when extending the expiration date of an existing instance. This approval policy suspends the expiration operation until the generated request is approved or rejected.

   Resizing an instance

   Approval policy that is invoked when resizing an existing instance. This approval policy suspends the resize operation until the generated request is approved or rejected.

   Capturing an instance

   Approval policy that is invoked when capturing an existing instance. This approval policy suspends the capturing operation until the generated request is approved or rejected.

Deleting an instance

Approval policy that is invoked when deleting an existing instance. This approval policy suspends the delete operation until the generated request is approved or rejected.

Requesting to attach storage to a virtual machine

Approval policy that is invoked when attaching storage to a virtual machine. This approval policy suspends the attach storage operation until the generated request is approved or rejected.

Requesting to detach storage from a virtual machine

Approval policy that is invoked when detaching storage from a virtual machine. This approval policy suspends the detach storage operation until the generated request is approved or rejected.

Saving a virtual machine image

Approval policy that is invoked when saving a virtual machine image. This approval policy suspends the save image operation until the generated request is approved or rejected.

Requesting to create virtual machine snapshot

Approval policy that is invoked when creating a virtual machine snapshot. This approval policy suspends the virtual machine snapshot operation until the generated request is approved or rejected.

Restoring a virtual machine

Approval policy that is invoked when restoring a saved virtual machine image. This approval policy suspends the restore operation until the generated request is approved or rejected.

Requesting to revert virtual machine to snapshot

Approval policy that is invoked when reverting a virtual machine to snapshot version. This approval policy suspends the revert to snapshot operation until the generated request is approved or rejected.

Deleting a volume

Approval policy that is invoked when a volume is deleted. This approval policy suspends the delete volume operation until the generated request is approved or rejected.

Creating a volume

Approval policy that is invoked when a volume is created. This approval policy suspends the create volume operation until the generated request is approved or rejected.

Updating a volume

Approval policy that is invoked when a volume is updated. This approval policy suspends the update volume operation until the generated request is approved or rejected.

Setting or modifying approval policies for a project

Follow these steps to set or modify an approval policy for a project. These policies override the approval policies that are set for a cloud.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access** > **Projects**.
2. Select the project for which you want to modify approval policies.
3. Select **Customize settings**.
4. Select **Approval Policies**.
5. Set the events that require administrator approval. To use setting defined for a cloud, select **Use cloud default**.

   Deploying an image

   Approval policy that is invoked when deploying an image to create an instance in the cloud. This approval policy suspends the deployment operation until the generated request is approved or rejected.

Extending the instance expiration time frame
Approval policy that is invoked when extending the expiration date of an existing instance. This approval policy suspends the expiration operation until the generated request is approved or rejected.

Resizing an instance
Approval policy that is invoked when resizing an existing instance. This approval policy suspends the resize operation until the generated request is approved or rejected.

Capturing an instance
Approval policy that is invoked when capturing an existing instance. This approval policy suspends the capturing operation until the generated request is approved or rejected.

Deleting an instance
Approval policy that is invoked when deleting an existing instance. This approval policy suspends the delete operation until the generated request is approved or rejected.

Requesting to attach storage to a virtual machine
Approval policy that is invoked when attaching storage to a virtual machine. This approval policy suspends the attach storage operation until the generated request is approved or rejected.

Requesting to detach storage from a virtual machine
Approval policy that is invoked when detaching storage from a virtual machine. This approval policy suspends the detach storage operation until the generated request is approved or rejected.

Saving a virtual machine image
Approval policy that is invoked when saving a virtual machine image. This approval policy suspends the save image operation until the generated request is approved or rejected.

Requesting to create virtual machine snapshot
Approval policy that is invoked when creating a virtual machine snapshot. This approval policy suspends the virtual machine snapshot operation until the generated request is approved or rejected.

Restoring a virtual machine
Approval policy that is invoked when restoring a saved virtual machine image. This approval policy suspends the restore operation until the generated request is approved or rejected.

Requesting to revert virtual machine to snapshot
Approval policy that is invoked when reverting a virtual machine to snapshot version. This approval policy suspends the revert to snapshot operation until the generated request is approved or rejected.

Deleting a volume
Approval policy that is invoked when a volume is deleted. This approval policy suspends the delete volume operation until the generated request is approved or rejected.

Creating a volume
Approval policy that is invoked when a volume is created. This approval policy suspends the create volume operation until the generated request is approved or rejected.

Updating a volume
Approval policy that is invoked when a volume is updated. This approval policy suspends the update volume operation until the generated request is approved or rejected.

Managing requests

When you deploy an image or when you initiate an action that requires approval from an administrator, a request is created and submitted to an administrator for approval. The status is set to Pending until the administrator handles the approval request.

You can set which actions require administrator approval by using the Approval policies function. For more information, see “Managing approval policies” on page 227.

Processing instance requests

When an image is deployed, initiating an instance, the deployment request may require approval by an administrator. The instance status is set to pending until the administrator handles the approval request.

About this task

You can process an instance request from the Instances tab or from the Requests tab. For more information about processing an instance request from the Instances tab, see “Processing requests from the Instances tab” on page 245

To process a pending request, follow these steps:

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access** > **Requests**.
2. Expand the **Request Details** section to review or update the request before approving.
3. Expand the **Comments** section to review comments or use the **Add Comment** link to provide additional comments.
   - Click **Approve** to approve the request and allow the deployment processing to start.
   - Click **Reject** to reject the request.
   - Click **Withdraw** to withdraw a request.

Clearing or archiving requests

You can clear or archive requests. Clearing requests deletes the requests while archiving requests saves them to an archive folder. By clearing requests, you can free space on your system and improve performance in the IBM Cloud Manager with OpenStack interface. Archive any requests that you may want to reference in the future.

About this task

To clear or archive a request, follow these steps:

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access** > **Requests**.
   - To clear requests, click **Clear**.
   - To archive requests, click **Archive**.
2. Use the Request filter to select a subset of requests to clear or archive. Filter by status or start and end date. If you filter by date, you must provide an end date.
   - To clear the selected requests, click **Clear**.
   - To archive the selected requests, click **Archive**. The filtered requests are saved in a file called `requests_<current time in milliseconds>.csv`. This file can be found in the `archives` folder, located in the IBM Cloud Manager with OpenStack configuration directory.

Managing expiration policies

Expiration policies require users to set an expiration period that specifies the maximum length of the instance lease and determine the lifecycle of expired instances.

You can set a default expiration policy for a cloud or for a project. Expiration policies set for a project override the expiration policies set for a cloud. After an expiration policy is set, you must set an expiration date whenever deploying an image from that cloud or project. However, the administrative user can set a date with no limitations.

If you are deploying an image from a cloud or project that does not have an expiration policy set, you can choose whether to set an expiration date.

The user who deployed the instance receives an email notification when the instance is about to expire. The user can extend the lease if extensions are enabled.

After the instance expires, it will be stopped. The instance can be automatically deleted after a limited time, which is specified by the grace period. If no grace period is specified, the instance is deleted immediately. This setting applies regardless of whether the instance expiration maximum is set.

Updating the default expiration policy for a cloud

You can update the default expiration policy for IBM Cloud Manager with OpenStack.

About this task

To update the default expiration policy, complete the following steps:

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Configuration** > **Clouds**.
2. Click the name of the cloud for which you want to update the expiration policy.
3. Click **Expiration Policies** to open the form.
4. Enter information for the default expiration policy and click **Save**.

   Note: To delete expired instances immediately, set the Grace period to `0`.

Updating the default expiration policy for a project

You can update the default expiration policy for IBM Cloud Manager with OpenStack project.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access** > **Projects**.
2. Select a project to open the project update page.

   Note: To delete expired instances immediately, set the Grace period to `0`.
3. Enter information for the default expiration policy.
   - If you select **Use cloud default**, the expiration of the deployment depends on the expiration configuration of the cloud to which the image belongs.
   - If you select **Customize settings**, the expiration policy overrides the expiration policy of the cloud to which images belong.
4. Click **OK**.

Managing flavors (OpenStack only)

A flavor is the prescribed size of a provisioned virtual machine. Each flavor has a unique combination of resource configurations and sizes.

Updating the flavor for an OpenStack cloud configuration

You can update the flavor that is configured for the cloud.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Configuration** > **Clouds**.
2. Select the cloud for which you want to modify flavors.
3. Click **Edit**.

4. Expand the **Flavors** section. You can create a flavor based on an existing flavor or you can create a completely new flavor.
5. Click the flavor name that you want to copy or click the **Create a new flavor** icon to create a new flavor.
6. Set the following required values:
   - `Name`
   - `Virtual CPUs`
   - `Memory (MB)`
   - `Storage (GB)`
   - `Swap(MB)` This option is only supported for KVM deployments.

   Notes:
   - When updating the flavor, only integers are valid for the processor, memory, storage, and swap sizes. Any fractional data is omitted.
   - After a flavor is created or updated, it can be used to deploy OpenStack images. However, the new or updated flavor might not be immediately available when configuring an image. If this occurs, you can reset the image configuration to the default values in order to pick up the flavor changes made in the cloud. For more information, see Configuring image deployment properties.
   - Flavors with a storage size of 0 have special meaning in OpenStack and are not supported by numerous hypervisors such as Hyper-V. Hypervisors that do support such flavors use the size of the image as the storage size when provisioning a virtual machine from the image.
7. Optional: Specify extra specifications. For information, see “Extra specifications.”

Extra specifications

A flavor might include properties that are in addition to the base flavor properties. These extra specifications are key value pairs that can be used to provide advanced configuration that is in addition to the configuration provided by the base flavor properties. This configuration is specific to the hypervisor.

Advanced configuration provided with flavor extra specifications might include the following:
- CPU shares
- CPU period
- disk read and write rates per second

In addition to enabling advanced hypervisor configuration, extra specifications are used in OpenStack as a mechanism to enable advanced placement by the scheduler with specific scheduler filters such as the ComputeCapabilitiesFilter and the AggregateInstanceExtraSpecsFilter. For specific information about using these filters, see the OpenStack documentation.

KVM extra specifications

Flavor extra specifications are supported as part of the KVM support with OpenStack that is provided with IBM Cloud Manager with OpenStack.

The following extra specifications enable tuning the CPU for a virtual machine:
- `quota:cpu_shares`
- `quota:cpu_period`
- `quota:cpu_quota`

The following extra specifications enable tuning the device I/O for a virtual machine:
- `quota:disk_read_bytes_sec`

- `quota:disk_read_iops_sec`
- `quota:disk_write_bytes_sec`
- `quota:disk_write_iops_sec`
- `quota:disk_total_bytes_sec`
- `quota:disk_total_iops_sec`

The following extra specifications enable tuning the network device interfaces for a virtual machine. However, they are not supported in IBM Cloud Manager with OpenStack since they are not used with OpenVSwitch.

- `quota:vif_inbound_average`
- `quota:vif_inbound_peak`
- `quota:vif_inbound_burst`
- `quota:vif_outbound_average`
- `quota:vif_outbound_peak`
- `quota:vif_outbound_burst`

PowerVC extra specifications

Flavor extra specifications are supported as part of the PowerVC support with OpenStack that is provided with IBM Cloud Manager with OpenStack.

The following extra specifications enable tuning the CPU for a virtual machine:

- `powervm:proc_units`
- `powervm:min_proc_units`
- `powervm:max_proc_units`
- `powervm:min_vcpu`
- `powervm:max_vcpu`
- `powervm:dedicated_proc`
- `powervm:share_idle`
- `powervm:uncapped`
- `powervm:shared_weight`
- `powervm:availability_priority`
- `powervm:processor_compatibility`

The following extra specifications enable tuning the memory for a virtual machine:

- `powervm:min_mem`
- `powervm:max_mem`

The following extra specifications enable tuning the boot volumes:

- `powervm:boot_volume_type`

For more information, see the PowerVC Information Center.

Extra specification labels

Because it can be difficult to determine the purpose of extra specifications from their names, you can label extra specifications.

In the *openstack.properties* file any property that contains the *com.ibm.cfs.openstack.flavor.extraspec.label.* prefix is considered a localizable label for an OpenStack flavor extra spec. The suffix of the property must be the extra spec name, and the value of the property must be the list of localized extra spec labels.

For example, you can provide a label for the `quota:cpu_shares` extra specification that is similar to the following:

```
com.ibm.cfs.openstack.flavor.extraspecs.label.quota:cpu_shares=CPU Shares, en_us=CPU Shares,
es=Porción de Procesador
```

The first value is the label for the default locale, which is followed by a list of locale=label pairs. Each time the extra specification is displayed in the IBM Cloud Manager with OpenStack user interface, the corresponding label is displayed, based on the locale of the end user.

Managing clouds

You can add, configure, edit, and remove clouds.

In the Cloud status window, you can see the status of all of the clouds that IBM Cloud Manager with OpenStack self-service portal is connected to. To view details about a specific cloud, select **Cloud settings**.

In the **Clouds** section of the **Configuration** tab, you can add, edit, and delete cloud configurations. When you edit cloud configurations, you can also set or update expiration policies and approval policies.

You can customize each cloud to have its own approval and expiration policies. You can also configure a network for a specific cloud.

Adding a cloud configuration

You can configure a cloud in the **Clouds** section of the **Configuration** tab.

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration** > **Clouds**.
2. Click **Add Cloud**.
3. Enter information in each of the fields that is denoted with a red asterisk (*).
4. Click **Add**.

What to do next

After you click **Add**, you are prompted to trust the cloud server SSL certificate. If you do not accept this certificate, the cloud configuration is not added.

Note: If you do not want to accept the default Approval or expiration policies, you can edit the cloud configuration after adding it.

Adding an OpenStack cloud configuration

When you deploy your cloud environment, the OpenStack cloud configuration is added automatically. However, if you added a new OpenStack region to your deployment, you must manually add the OpenStack cloud configuration for the new region.

Before you begin

Before you begin these steps, ensure that the *ceilometer* and *heat* users exist on the **`com.ibm.cfs.cloud.openstack.service.users`** property in the `/var/opt/ibm/.SCE42/openstack.properties` file. If the *ceilometer* and *heat* users do not exist, add them and restart the sce service before continuing. For more information, see “User management with OpenStack” on page 250.

To add an OpenStack cloud configuration, follow these steps:

Procedure

1. Log in to IBM Cloud Manager with OpenStack self-service portal as an administrator.
2. Click the **Configuration** tab and select **Clouds** in the navigation pane.
3. Click **Create a new cloud configuration**.
4. Enter the cloud configuration settings for the OpenStack cloud.

   Name Assign a name to the OpenStack cloud that you want to create.

   Description
   Optionally, add a description for the OpenStack cloud.

   Type Select **OpenStack** for the cloud type.

   Region
   Select the region that you want to use for this OpenStack cloud.

   Message Queue Settings

   Message queue type
   Select the message queue type that is used by the OpenStack cloud.

   Host name
   Select the host name or the IP address of the OpenStack controller node. For more information, see "Customizing the messaging service attributes" on page 123.

   Port Accept the default value of **5671**.

   Secure the cloud connection using SSL
   Select if the OpenStack cloud is configured to expose an SSL connection. By default it is selected.

   User ID
   Enter the user ID that communicates with the messaging server. The user ID is based on the message queue type selected. Enter *rabbitclient* when the message queue type is RABBIT or enter *qpidclient* when the type is QPID.

   Password
   Type the password for the user ID. For password information, see "User names and passwords" on page 263.
5. Click **Add** to finish.

Results

If you receive a PKI token error when you are attempting to configure the OpenStack cloud, see "PKI error when adding OpenStack cloud with self-service portal" on page 322 for more information.

OpenStack clouds:

When you add an OpenStack cloud, IBM Cloud Manager with OpenStack self-service portal enters a transactional mode for user and project operations. Also, OpenStack relies on Coordinated Universal Time (UTC) time.

When in transactional mode, all user and project operations fail if the OpenStack cloud is unavailable. These operations fail even if the user or project in question is not currently used in connection to OpenStack.

Additionally, IBM Cloud Manager with OpenStack self-service portal uses OpenStack efficient polling with the **changes-since** parameter support to maintain internal caches of certain OpenStack resources. The OpenStack **changes-since** support relies on Coordinated Universal Time (UTC) time to determine if a resource has changed. As a result, the IBM Cloud Manager with OpenStack self-service portal and

OpenStack systems must maintain accurate and consistent UTC time to avoid caching and other problems that can occur due to incorrect system time. For more information about user and project management with OpenStack, see User management with OpenStack and Project management with OpenStack.

Multiple cloud support

IBM Cloud Manager with OpenStack allows you to manage multiple clouds from a single instance. For example, you can have a test cloud set up to implement your latest policies before moving those policies to your production cloud.

This support also allows you to manage multiple types of clouds For example, you can have multiple VMware cloud instances available from a single IBM Cloud Manager with OpenStack user interface.

Updating a cloud

You can update a cloud in the **Clouds** section of the **Configuration** tab.

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration** > **Clouds**.
2. Click the name of the cloud that you want to update.
3. Update the desired fields and click **Save**.

   Tip: From this configuration panel, you can also review or change the **Expiration Policies**, **Approval Policies**, and **Flavors (OpenStack cloud)** of the cloud. For more information, see the following topics:
   - "Managing expiration policies" on page 230
   - "Managing approval policies" on page 227
   - "Managing flavors (OpenStack only)" on page 231

Removing a cloud

You can remove an association with a cloud from IBM Cloud Manager with OpenStack from the **Clouds** section of the **Configuration** tab.

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration** > **Clouds**.
2. Select the cloud that you want to remove. You can either remove just the cloud, or remove the cloud and all instances that were deployed by IBM Cloud Manager with OpenStack.
3. Click **Remove**.
4. Click **Remove Cloud Only** to remove just the cloud, or click **Remove cloud configuration and all related instances** to remove the cloud and all instances that were deployed by IBM Cloud Manager with OpenStack.
5. Click **Yes** to confirm.

Results

Note: When removing a cloud configuration, all of the cloud resources created by IBM Cloud Manager with OpenStack are lost. Recreating the connection to the cloud at a later time will not recover these resources

Changing the message queue option

If you have any regions that were upgraded without using the `--use-qpid` option, and you are using the self-service portal to manage IBM Cloud Manager with OpenStack, you must change the message queue option in the self-service portal to `rabbitmq` for each of those regions.

Before you begin

Without completing this task, the regions are in error state on the self-service portal after an in-place upgrade.

About this task

To change the message queue from `qpid` to `rabbitmq` on the self-service portal manually, complete the following steps for each region until all the clouds are connected properly.

Procedure

1. Log in to the self-service portal web interface as an administrator.
2. Click the **Configuration** tab and select **Clouds** in the navigation pane.
3. Click the name of the cloud (in the table) that corresponds to the region to display the cloud properties.
4. Click **Edit**.
5. Change the message queue to *rabbitmq* for the cloud. The message settings are as follows:
   - **`User ID`**: *rabbitclient*
   - **`Password`**: Enter the password of the rabbitmq message queue.
   - **`Message queue type`**: *RABBIT*
   - **`Virtual host`**: Use the default value, /.
6. Click **Save**.
7. Click **Refresh**. The state of the cloud is updated to *OK*.

Managing network configurations

The IBM Cloud Manager with OpenStack self-service portal provides a convenient way to manage and apply network settings by using network configurations. Network configurations are a group of network settings for a particular environment, typically a virtual network. These settings can be managed as a single entity and applied to image configurations or instance deployment settings.

For example, suppose that a cloud environment contains two virtual networks applicable to instance deployment: a public and a private virtual network. In this case, an administrator might create two network configurations, one for the public and one for the private. In the public configuration, the administrator would specify all the public network settings such as primary DNS, secondary DNS, and primary gateway. The same would be done for the private network configuration. After the configurations are created, the administrator can configure the images to use the appropriate network configuration. This action saves time by not requiring the administrator to specify each network setting in each image. It also allows an easier way to manage the network settings on a virtual network.

While the actual settings specified in a configuration are tailored to a specific environment, the network configurations themselves are a superset of all network settings regardless of image, operating system, or cloud management system. Therefore, all settings that are specified in a configuration are applicable. For example, the primary and secondary WINS settings of a network configuration are only applicable to Windows based images. So when you create a configuration for an image that is not using Windows, these values are not needed and can be left blank.

Note: With the self-service portal, you can specify the network configuration for a cloud. The self-service portal displays only the fields that are applicable for that cloud. Before you can create an OpenStack network configuration, you must select an existing OpenStack cloud.

When network configuration settings are applied to either an image configuration or during an advanced instance deployment, their individual settings can be overridden or manually specified, if wanted.

Note: You cannot override or manually specify OpenStack network configuration settings.

Managing network configurations

You can create, edit, and delete, network configurations from the IBM Cloud Manager with OpenStack web interface.

About this task

To create, edit, or delete a network configuration, follow these steps:

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration**.
2. Select **Network**.

   The network configurations that are defined in the property files are displayed. The Network tab provides a listing of all existing network configurations, and enables you to edit, create, or delete these network configurations.

   - The Network Configuration column shows the name of the existing network configuration.
   - The Cloud column shows the name of the cloud scope that is associated with the network configuration.
   - The Type column shows the IP address version that the network configuration supports. VMware network configurations support only IPv4 addresses, but OpenStack network configurations can support IPv4 or both IPv4 and IPv6 addresses. OpenStack networks do not support IPv6-only addresses.
   - The Available Addresses column shows the number of IP addresses available in the network.
   - The Allocated Addresses column shows the number of IP addresses that are allocated.

   You can edit, create, or delete these network configurations.

   - To view specific network configuration properties, click the network configuration name.
   - To edit specific network configuration properties, click the network configuration name and then click **Edit**.
   - To manage the IP addresses for an existing configuration, click **Manage IP Addresses** for the existing configuration.
   - To create a new network configuration, click the New icon.
   - To create a new network configuration that is based on an existing configuration, select a configuration and click the Copy icon.
   - To delete an existing configuration, select a configuration and click the Delete icon.

Adding a network configuration

You can add a network configuration from the IBM Cloud Manager with OpenStack web interface.

Before you begin

z/VM only

The `/etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini` file contains a **`network_vlan_ranges`** value similar to the following:

```
network_vlan_ranges = xcatvsw2,xcatvsw3:2:3999
```

Before you can add a network configuration for an OpenStack cloud running on z/VM, follow these steps:

1. Create two networks in the OpenStack environment as follows:
   a. First, run the following command to create the management network:

      Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

      ```
      neutron net-create xcat_management --provider:network_type flat
         --provider:physical_network xcatvsw2
      ```

   b. Next, run the following command to create the customer network:

      Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

      ```
      neutron net-create opnstk_compute --provider:network_type vlan
         --provider:physical_network xcatvsw3 --provider:segmentation_id 2
      ```

2. Define a subnet for each network as follows:
   a. Run the following command to define the subnet for the management network:

      ```
      neutron subnet-create --allocation-pool start=10.1.0.2,end=10.1.0.199 xcat_management 10.1.0.0/16
      ```

      Note: You can change the IP range to any value that you want. The Extreme Cloud Administration Toolkit (xCAT) MN interface can connect this range.

   b. Run the following command to change the IP range for the customer network:

      ```
      neutron subnet-create opnstk_compute cidr
      ```

      Note: You can use any IP address that you want.

When you use IBM Cloud Manager with OpenStack to connect to z/VM, the network configuration in OpenStack is done.

About this task

To add a network configuration, follow these steps:

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration**.
2. Select **Network**.
3. To create a network configuration, click **New**.
4. Specify a cloud scope.

   When you specify a cloud scope, the network configuration that you are adding is only available when you deploy an image to that cloud. If you specify VMware for the cloud scope, the configuration is available to all VMware images. When you specify a cloud scope, this page displays only the fields that are applicable to the selected cloud scope.
5. Enter a name for the configuration.
6. Follow the steps for the cloud scope that you selected.
   - **VMware**
     a. Optionally, enter a description.
     b. Select a unique Network ID.
     c. Select one of the following IP Settings:
        – **Use DHCP**
        – **Use IP address pool**

          If you select **Use IP address pool**, follow these steps:

          1) Specify a Subnet mask and Gateway address. You can also provide an alternative gateway address.

2) Specify a number of IP addresses and the starting address for allocation. The ending address is calculated based on the number of addresses and starting address.

   Note: If you specify a number of IP addresses, the number must be at least 2. To create a single IP address, you must first create then network configuration, and then add the single IP address.

3) Specify DNS Settings.

d. Specify System-wide settings, including Linux and AIX Network Settings and Windows Network Settings.

e. Choose to be a member of a domain or a workgroup:

   - **Domain**

     If you select Domain, specify the domain name, user, and password.

   - **Workgroup**

     If you select Workgroup, specify the workgroup name.

f. If you selected **Use IP address pool**, you can also select **Obtain host name and domain name from DNS server**. If you select this option, the DNS used by the system must correlate with the DNS used by this application. If it does not, the names that are obtained might be different from the name that is resolved by the system DNS. The DNS server must be configured correctly for the operating system of the IBM Cloud Manager with OpenStack server. If the names cannot be resolved, the host name prefix and domain name that are provided in this configuration are used.

   Note: Only the host name and domain name are configured when you select **Obtain host name and domain name from DNS server**. For other setup, such as the DNS IP address, you must configure those settings manually when an image is deployed.

g. Click **Save**.

- **OpenStack**

  a. Select one of the following IP address versions:

     - IPv4 only
     - IPv4 and IPv6

       If you select IPv4 and IPv6, you can enter separate IP address settings for IPv4 and IPv6 addresses. However, the number of IPv6 addresses to allocate must be the same as the number of IPv4 addresses.

  b. Specify a subnet mask (for IPv4) or prefix length (for IPv6) and gateway address.

  c. Specify a number of IP addresses and the starting address for allocation. The ending address is calculated from the number of addresses and the starting address.

     Notes:

     1) There must be at least two IP addresses.

  d. Specify DNS settings.

  e. Specify provider network settings as follows:

     - Specify one of the following network types:

       - **None selected**

         A network is created based on the **`tenant_network_type`** property in the `/etc/neutron/plugin.ini` file. This value is set to vlan in the SCE image. If this option is used, the physical network name and vlan ID are automatically selected based on the "network_vlan_ranges" property in `/etc/neutron/plugin.ini` file. This property is set to **default:1:4094** in the SCE image.

       - **Flat**

A virtual network that is realized as packets on a specific physical network that contains no IEEE 802.1Q header. Each physical network can realize at most one flat network.

- **Local**

  A virtual network that allows communication within a host, but not across the network. Local networks are intended mainly for single-node test scenarios.

- **VLAN**

  A virtual network that is realized as packets on a specific physical network that contains IEEE 802.1Q headers with a specific VLAN id. VLAN networks that share a physical network are isolated from each other. Each distinct physical network that supports VLAN networks is treated as a separate VLAN trunk, with a distinct space of VLAN id values.

- If you select **Flat** or **VLAN** for the network type, enter the physical network name.

  This physical network name must match the name that is specified in the **`network_vlan_ranges`** property of the `/etc/neutron/plugin.ini` file.

  Note: You can create only one Flat network on each physical network.

- If you select **VLAN**, enter the VLAN ID.

  Valid VLAN ID values are 1 through 4094.

f. Click **Save**.

Editing network configurations

You can edit a network configuration from the IBM Cloud Manager with OpenStack self-service portal.

About this task

To edit a network configuration, follow these steps:

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration**.
2. Click **Network**. The network configurations that are defined in the property files are displayed.
3. Select a network configuration that you want to edit from the list of available configurations. The current properties are displayed for the selected configuration. The properties that are displayed depend on the cloud management system for which the network configuration was created.
4. Click **Edit**. You can edit only certain network configuration properties.
5. Change the properties of the configuration. If you want to edit the IP addresses for this configuration, click **Manage IP Addresses**. For more information about setting up an IP address pool, see “Managing IP address pools.”
6. Click **Save** to save your changes, or **Cancel** to exit the screen without saving your changes.

Managing IP address pools

IBM Cloud Manager with OpenStack can automatically select the IP address (or IP addresses) to be used when provisioning a virtual machine from a list of predetermined IP addresses known as an IP address pool. IP addresses are managed and assigned automatically to an instance so that the user requesting the deployment does not need to specify them.

About this task

An IP address is marked as "In Use" when IBM Cloud Manager with OpenStack selects that IP addresses from the network configuration and uses it for the deployment of an instance. When the instance is deleted by IBM Cloud Manager with OpenStack, the IP address "In Use" indication is cleared so that the IP address can be reused by another instance deployment. If IBM Cloud Manager with OpenStack detects that the instance has failed and no longer exists in the cloud, the IP address is unlocked immediately and the "In Use" flag cleared.

The administrator can also mark an IP address or a range of IP addresses as "Locked". "Locked" IP addresses are not selected by IBM Cloud Manager with OpenStack for instance deployment. The purpose of "Locked" IP addresses is to allow the administrator to mark certain IP addresses in the network as reserved or "In Use" by other applications. If the administrator later wants to enable the IP address so that it can be used by IBM Cloud Manager with OpenStack for instance deployment, the "Unlock" option can be used to remove the "Locked" indicator.

The main difference between "In Use" and "Locked" is conceptual; addresses that are "In Use" are being used by the IBM Cloud Manager with OpenStack application, while addresses that are "Locked" are being used by an external application or are not available as specified by an administrator.

Each network configuration contains its own IP address pool, which allows IP addresses to be managed on a per network configuration basis. If a configuration is applied to the deployment settings of an instance (and the configuration is not set to use DHCP), the IBM Cloud Manager with OpenStack automatically uses the pool that is associated with the configuration.

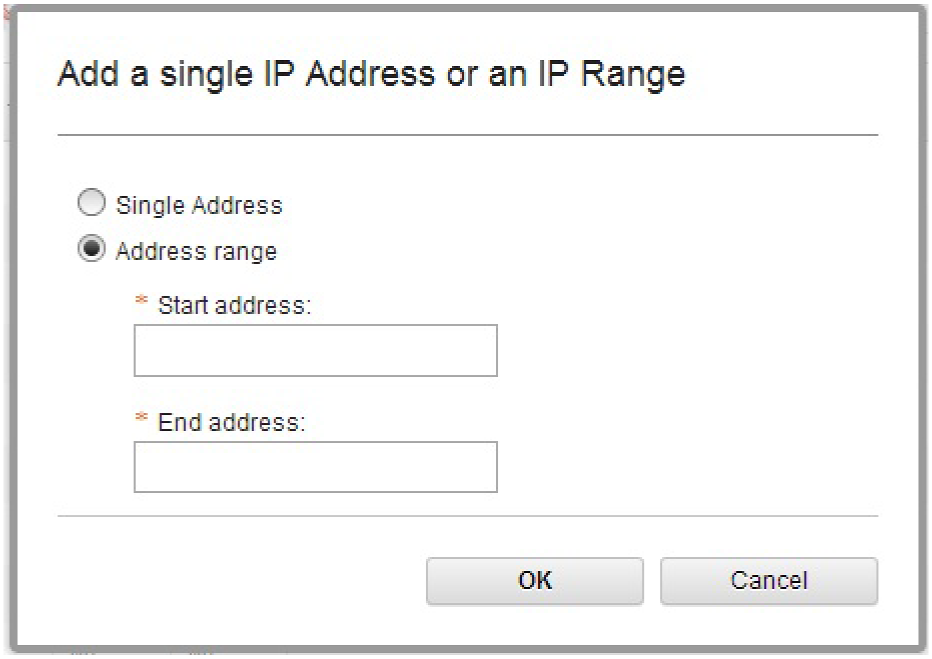
Notes:

1. Network configurations typically represent a VLAN or a virtual network. While a network configuration cannot contain the same IP address more than once, different network configurations can contain the same IP addresses. This behavior was added to allow multiple VLANs to use the same IP address ranges. If the same IP address ranges are specified in multiple network configurations, care must be taken to ensure that these network configurations are used on different networks or VLANs.
2. OpenStack network configurations cannot contain the same IP addresses. Each of the IP subnets that are defined in the OpenStack network configurations must be unique and must not overlap.
3. The IP addresses for an OpenStack network configuration are specified when the OpenStack network configuration is first created. IP addresses cannot be added to or removed from an OpenStack network configuration. Lock and unlock of IP addresses is supported.

The following steps describe how an administrator can manage the IP address pools that are used by the IBM Cloud Manager with OpenStack application.

Procedure

1. Open IBM Cloud Manager with OpenStack and select **Configuration** > **Network**.
2. From the Network page, select **Edit under IP Addresses**.
3. The **IP Addresses** view is displayed. Use this view to add, remove, lock, or unlock IP addresses.
4. To add IP addresses, select **Add**.
   a. Add an individual or range of IP addresses to the pool.
   b. Select **OK** to add the IP address or range, or select **Cancel** to cancel the operation.



Add a single IP Address or an IP Range

○ Single Address

● Address range

* Start address:

* End address:

5. To remove, lock, or unlock specific IP addresses, select the IP addresses to which to apply the operation, then select **Remove**, **Lock** or **Unlock** from the Manage IP addresses page to apply the operation.

   Note: The IP addresses page allows for smart selection of IP addresses to which to apply the Remove, Lock, and Unlock operations. When Remove, Lock, or Unlock is selected, smart selection determines whether any addresses are selected on the page. If addresses are selected, the operation is applied to the selected addresses without an extra dialog. If no addresses are selected, a dialog is displayed which allows either individual or range based operations for remove, lock, or unlock.

Managing external networks and floating IP addresses

External networks typically provide Internet access for your instances.

By default, the external network allows Internet access only from instances using Network Address Translation (NAT). You can enable Internet access to individual instances using a floating IP address and suitable security group rules. The *admin* tenant owns this network because it provides external network access for multiple tenants. You must also enable sharing to allow access by those tenants.

External networks

Use the following steps to create the external network and allow the instance to connect to the public network.

Procedure

1. Create an external network.

   ```
   $ neutron net-create ext-net --shared -—router:external True
   ```

2. Create a subnet for the external network.

   ```
   $ neutron subnet-create ext-net --name ext-subnet \
   --allocation-pool start=FLOATING_IP_START,end=FLOATING_IP_END \
   --disable-dhcp --gateway EXTERNAL_NETWORK_GATEWAY EXTERNAL_NETWORK_CIDR
   ```

   For example:

   ```
   $ neutron subnet-create ext-net --name ext-subnet \
   --allocation-pool start=10.6.12.100, end=10.6.12.200 \
   --disable-dhcp --gateway 10.6.12.1 10.6.12.0/24
   ```

3. Create a router.

```
$ neutron router-create ext-to-int
```

4. Connect the router to `ext-net` by setting the gateway for the router as `ext-net`.

   ```
   $ neturon router-gateway-set ext-to-int-id ext-net-id
   ```

5. Add the router interface to an existing private network. If you don't have one, you must create it.

   ```
   $ neutron router-interface-add ext-to-int-id private-subnet-id
   ```

   Start an instance with the dedicated private network, and now the instance can connect to the public network.

Floating IP addresses

A floating IP address is an IP address that a project can associate with a virtual machine. This association gives the instance the same public IP address each time that it starts. You can create a pool of floating IP addresses and assign them to instances as they are started, to maintain a consistent IP address for maintaining DNS assignment. Complete the following steps to associate a floating IP address to an instance.

Procedure

- Create a floating IP address.

  ```
  $ neutron floatingip-create ext-net
  ```

- Associate the floating IP address to the port of the instance.

  ```
  $ neutron floatingip-associate floating_ip_id instance_port_id
  ```

  Now you can connect the instance by the floating IP address in the public network.

  Note: Ensure that you have added the right security group rules to the instance so you can **`ping`** or **`ssh`** the instance.

What to do next

The default security group does not allow inbound traffic from the external network to the virtual machine instance that uses the floating IP address. To add rules that all of the external networks can use to communicate with the virtual machine instance, see “Configuring SSH and ICMP access to deployed virtual machines” on page 157.

Managing instances

Use the Instances tab in the IBM Cloud Manager with OpenStack self-service portal to manage instances after they are created.

VMware: An instance in the self-service portal is equivalent to a VMware virtual machine. All of the VMware virtual machines are displayed on the self-service portal Instances tab.

You can filter the list of instances by Cloud, Projects, or Architectures.

As an administrator, you can act on pending instance requests and hide specific instances from appearing to other users.

Note: When you start or restart the self-service portal on a high scale cloud, the synchronization between the self-service portal and the cloud might take longer than expected. This resynchronization might cause operations such as deploying, deleting, or resizing an instance to be delayed or even fail. Wait for the synchronization to complete before you attempt these actions.

Capturing an instance

You can capture an instance or workload to create an image.

When you capture an OpenStack PowerVC instance, a message is displayed to indicate that capturing this instance requires some manual preparation. For information about preparing an OpenStackPowerVC instance for capture, see Capture requirements in the PowerVC information center at the following web page: http://www.ibm.com/support/knowledgecenter/SSXK2N_1.2.1/com.ibm.powervc.standard.help.doc/powervc_standard.html

Note: For OpenStack PowerVM, you can only capture instances that are stopped.

For information about capturing an OpenStack instance, see "Considerations for capturing an OpenStack instance" on page 191

Pinning an instance

In a deployed instance, you can pin a virtual machine to a specific physical host to prevent the server from being relocated. However, an instance or workload that is set to be highly available cannot have pinned virtual machines.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Instances**.
2. Select an instance to open the properties.
   - To pin an instance, select **Pin**.
   - To unpin an instance, select **Unpin**.
3. Click **Close**.

Migrating an instance (OpenStack)

In a deployed instance, you can migrate a virtual machine to a specific physical host. You can also migrate multiple instances to a specific physical host.

Before you begin

Make sure that the instances that you want to migrate have a status of OK. If you are migrating multiple instances, all the instances must be running on a common OpenStack cloud.

Note: If you are using a PowerVC virtualization environment, overcommitting a disk and migrating non-shared storage are not supported for PowerVM instances. For more information about PowerVC live migration settings and capabilities, see the PowerVC Information Center.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Instances**.
2. Select the instances that you want to migrate.
3. Click **More** > **Migrate to new host** to open the live migration page.
4. Select a destination host as follows:
   - To specify that the system select a destination host, select **Allow system**.

     If the associated instance is a PowerVM instance and its **Use PowerVC placement policy** virtual machine property is *true*, then the *Allow system* property indicates that the PowerVC scheduler selects a host.
   - To manually select a destination host, select **Manually select** and then select a destination host.
5. Click **Migrate**. The instance status changes to Migrating.
6. Click the refresh arrow to update the status. When the status changes from Migrating to OK, the migration is complete and the instance is available

Processing requests from the Instances tab

When an image is deployed, initiating an instance, the deployment request may require approval by an administrator. In this case, the instance status is set to pending until the administrator handles the approval request.

About this task

You can process an instance request from the Instances tab or from the Requests tab. For more information about processing an instance request from the Requests tab, see "Processing instance requests" on page 230

To process a pending request, follow these steps:

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Instances**.
2. Select an instance name to view the instance details. Find the request list in the instance details and select a request to display. The Request properties page appears.
3. Expand the **Request Details** section to review or update the request before approving.
4. Expand the **Comments** section to review comments or use the **Add Comment** link to provide additional comments.
   - Click **Approve** to approve the request and allow the deployment processing to start.
   - Click **Reject** to reject the request.
   - Click **Withdraw** to withdraw a request.

Hiding or showing an instance

Follow these steps to show or hide an instance.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Instances**.
2. Select an instance and click **Hide/Show** to hide or show the instance in the instance list for all non-administrative users.
3. After an instance is hidden, a non-administrative user does not see the instance in the instance list, but administrative users can choose to display the hidden instance. To display hidden instances in the instance list, select **Include hidden instances**.

Resizing an instance (VMware)

You can modify the amount of resources used by the virtual machines provisioned by your instance running on VMware. Depending on how your VMware virtual machines are configured, you can add memory and virtual processors while your virtual machine is running.

About this task

Increasing the size of the virtual machine disks makes more space available on the disk, but does not change the size of the partitions and the file systems. There are commands that must be run on the guest operating system to increase the size of the file system. For more information about how to change the size of the file system after storage is added, see your operating system documentation.

For more information about how a running virtual machine handles changes in memory and processor, see the VMware documentation and your operating system documentation.

Procedure

1. Click the name of the instance that you want to resize.
2. Click **More** > **Resize**.
3. Update the number of processors and memory resources to be allocated to the virtual machine in your instance.

   The settings that can be resized when a virtual machine is in the started state depend on how the virtual machine is configured on VMware:

Notes:

a. If the instance is started and the virtual machine is not configured to allow memory or processor changes, those fields are not displayed. To change those values, you must first stop the instance.

b. For memory, the virtual machine must have the Memory Hot Add option enabled. Memory is only allowed to be increased, and the maximum amount that is allowed, and the valid values, are determined by VMware.

c. For processors, the virtual machine must have the processor Hot Plug option enabled. To remove processors, the virtual machine must have the processor Hot Add and Remove option enabled. The maximum number of processors that are allowed is determined by the number of logical processors on the vSphere machine that is running the virtual machine.

d. If you are changing the storage size, you can update only to a larger disk size.

4. Increase the disk size.
5. Click **Resize**.

   Note:

   - If approvals are enabled, then the approval must be completed before the instance is resized.
   - Linked clone disks or disks that are using an IDE controller cannot be resized.

Resizing an instance (OpenStack)

You can modify the amount of resources that are used by the virtual machines.

About this task

Stop the instance before you continue the procedure.

Procedure

1. Click the name of the instance that you want to resize.
2. Click **More** > **Resize...** to open the Resizing instance page.
3. Under the **Hardware** section, update the **OpenStack Flavor** to be allocated to the virtual machine in your instance.

   Notes:

   - The flavor details change depending on the size flavor that you select.
   - When you update the flavor, the processor, memory, and storage size fields accept integers only. Any fractional data is omitted.
   - (PowerVM and Hyper-V) If you are changing the storage size, you can update to a larger disk size only.
   - (KVM and PowerKVM only) If you choose a flavor with a smaller storage size, KVM skips to storage resize if it cannot be completed. The other resources are resized accordingly.
   - (KVM and PowerKVM only) Resizing an instance only supports local storage.
   - (z/VM only) You can change only the CPU and memory resources assigned to the virtual machine.
4. Click **Resize**.

   Notes:

   - If approvals are enabled, then the approval must be completed before the instance is resized. To verify that the instance was resized, check the virtual machine **flavor ID** property of the instance.
   - If the instance is running, OpenStack stops, resizes, and restarts the instance after the hypervisors are resized (except PowerVM instance).
   - Active resize is supported for PowerVC instances. The instances stay active during the resizing progress. The active resize action is limited by instance resource ranges (maximum and minimum values of processor, memory, and processor units), and unsupported flavors are filtered. In addition,

the active resize action is not allowed unless the health status of the instance is *OK*. For more information about resource ranges, see “Extra specifications” on page 232.

- (Multiple PowerKVM hypervisors) You might encounter the following error `ssh ...Permission denied`. As a Nova user, ensure the hypervisors can **`ssh`** to each other by public key. For more information, see “SSH permissions error when resizing an instance (OpenStack)” on page 318.

If you are resizing an instance on the Hyper-V hypervisor, the **`IBMComputeNodeService`** service that is deployed with the Hyper-V agent installer must run with domain credentials and configure Kerberos constrained delegation. You can set the service credentials by using the following command:

```
C:\sc config "IBM SmartCloud Entry Compute Service" obj="DOMAIN\username" password="password"
```

.

To configure the Kerberos constrained delegation setting, see step 1 in the following guide: Configure constrained delegation.

Managing storage volumes

If you have an OpenStack cloud, you can use the **Volumes** tab in IBM Cloud Manager with OpenStack self-service portal to create and manage storage volumes for your virtual machines. You can manage the volumes by sorting on the cloud and project to which the volumes and associated virtual machines belong.

About this task

From the **Volumes** tab you can create, delete, edit, and attach and detach storage volumes for virtual machines in your OpenStack environment.

When you add a volume, you can choose the source for the new volume. You can create an empty volume, or you can create a volume that is sourced from an existing image or snapshot of a volume. To create an image from a snapshot, you must capture an existing volume and use the captured volume as the snapshot source.

Note: PowerVC does not support a snapshot of a volume. So while, the self-service portal does not prevent a snapshot volume in PowerVC, the snapshot volume cannot be supported by IBM Cloud Manager with OpenStack either.

When you delete a volume, all data is lost from the volume. Alternatively, you can detach a volume from a virtual machine to retain the content of the volume and use it in the future by attaching it to a different instance.

Procedure

1. On the **Volumes** tab, use the **Cloud** and **Project** controls to sort the volumes that you want to manage.
2. Use the **Add** and **Delete** icons to add and delete volumes.
3. Use the **More** menu to complete tasks such as**Attach**, **Detach**, and **Capture** on a selected volume.
4. To edit an existing volume, click the volume and select **Edit**.

What to do next

Note: You also can manage storage volumes for a specific virtual machine from the **Instances** tab. Click the virtual machine for which you want to manage storage, and expand **Storage Volumes**.

Managing users

Administrator The **Users** tab in the IBM Cloud Manager with OpenStack self-service portal is enabled for administrative users and is used for creating, viewing, and managing users.

Creating a user

Complete the following steps to create a user.

Procedure

1. In the IBM Cloud Manager with OpenStack self-service portal, select **Access**.
2. Select **Users**.
3. Click **New User**.
4. Enter information for the new user.
5. Click **Create**.

   Notes:

   - You can only create valid user accounts when using local authentication. When using LDAP authentication, user accounts are created and managed directly through the LDAP server.
   - A user can also request a new user account. To approve or reject these requests, go to **Access** > **Requests**.

Viewing or updating a user

About this task

To view or update information about a user, follow these steps:

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access**.
2. Select **Users**.
3. To view or update information about a user, select the user you want to view.

Locking a user

If you want to prevent a user from accessing the IBM Cloud Manager with OpenStack self-service portal, you can lock the user account.

About this task

To lock a user, follow these steps:

Procedure

1. Open the IBM Cloud Manager with OpenStack self-service portal and select **Access**.
2. Select **Users**.
3. Select the user to unlock and click **More** > **Lock**.

Unlocking a user

If a user has three invalid login attempts in a 24 hour period, the user account becomes locked and requires an administrator to unlock it.

About this task

To unlock a user, follow these steps:

Procedure

1. Open the IBM Cloud Manager with OpenStack self-service portal and select **Access**.
2. Select **Users**.
3. Select the user to unlock and click **More** > **Unlock**.

What to do next

Note: If the default administrator account becomes locked, it is unlocked when the server is restarted.

Deleting a user

Complete the following steps to delete a user.

Procedure

1. In the IBM Cloud Manager with OpenStack interface, select **Access**.
2. Select **Users**.
3. Select the user you want to delete from the list of users and click **Delete**.
4. To confirm the user deletion, select **Yes**. To cancel the user deletion, select **No**.

   Note: A user can also request to delete his user account. To approve or reject these requests, go to **Access** > **Requests**.

User management with OpenStack

Unlike other cloud types, OpenStack clouds provide native support for user management through the OpenStack keystone component.

When you first connect to an OpenStack cloud, the IBM Cloud Manager with OpenStack self-service portal imports all the user accounts that currently exist in OpenStack. All user roles and project membership are accepted and reflected in the self-service portal.

After the IBM Cloud Manager with OpenStack self-service portal imports the initial OpenStack users and connects to an OpenStack cloud, the self-service portal enters transactional mode for user management. When in transactional mode, all operations that are performed in the self-service portal are also performed in OpenStack (for example, keystone). If a user management operation (such as any of the operations that are described in this section) fails to complete successfully in the self-service portal, it does not occur in OpenStack. Likewise, if it fails in OpenStack it reverts in IBM Cloud Manager with OpenStack self-service portal.

The self-service portal enters transactional mode for user operations while connected to OpenStack so that the user registries in both products are always synchronized. For this reason, when connected to an OpenStack cloud, it is not possible to perform user-related operations while the OpenStack cloud is down or unavailable. In addition, the users created using Keystone are only synchronized when the self-service portal is restarted. This cannot be done manually from the self-service portal.

The user email and project membership changes made using Keystone are only synchronized when the self-service portal is restarted. If you cannot restart the self-service portal, these changes must be made manually from the self-service portal.

Restriction: If a user is deleted directly using Keystone, you also must delete this user manually from the self-service portal, after the self-service portal is restarted. The user name is not allowed to change directly using Keystone. If the user name is changed directly using Keystone by mistake, the old name, and new name are not allowed to log in before the self-service portal is restarted, and the old name is changed back in Keystone after the self-service portal is restarted. After that, the old name can log in. If you cannot restart the self-service portal, you must change back to the old name manually from the self-service portal. You cannot change or delete the `admin` user directly using Keystone.

To connect to OpenStack, IBM Cloud Manager with OpenStack self-service portal uses a service user account and a default service tenant. Some installations of OpenStack have user accounts specific to OpenStack components (for example, Nova, Keystone, Neutron). These and other service user accounts or service tenants in an OpenStack server that do not represent an actual user account or tenant, can be added to the list of service users and service tenants. By doing so, they are ignored by IBM Cloud

Manager with OpenStack and those service users are not allowed to log into the IBM Cloud Manager with OpenStack self-service portal. To make this change, add the service users and tenants to the comma-separated list of users in the *com.ibm.cfs.cloud.openstack.service.users* property, or the comma-separated list of tenants in the *com.ibm.cfs.cloud.openstack.service.tenants* property, in the *openstack.properties* file.

Managing accounts

You can view information for those accounts of which you are either an owner or a member.

Accounts are required when IBM Cloud Manager with OpenStack self-service portal billing is enabled. See the following guidelines for self-service portal billing:

- Only self-service portal administrators can create accounts, but you can be made an account owner.
- You can deploy instances only if you are an account member and the account has a positive balance with which to pay for server use.
- Only account owners and self-service portal administrators can manage accounts.
- Accounts have a balance, an owner, an account balance threshold, account members, and invoices.
  - The *balance* is a monetary balance of the account. The cost of each request and running deployment is subtracted from the balance over time.
  - The account *owner* is the self-service portal user profile that is accountable for crediting and paying the account.
  - The *account balance threshold* is a value that represents the amount at which the account balance becomes a *low balance*. If the balance drops to zero, the account is delinquent.
  - The *account members* are self-service portal users that belong to the account. When account members deploy instances in the self-service portal, the instances are billed to their account.
  - Each instance has an *invoice*. An account can have many invoices, which are viewable from the Account properties window.

Creating an account

You can create an account at any time.

Procedure

1. Click **New Account**.
2. Enter information for the new account. Both the **Account name** field and the **Account owner** field are required.
3. Click **Create.**

Add members to an account

You can add members to your account at any time, however, users can only be members of one account at a time.

Procedure

1. In the account table, select the account to which you want to add members.
2. To open the account member management window, click **Edit list**.
3. To add a member, select the member to be added from the **Available users** list and click **Add**.

Viewing or managing an account

You can view the properties of any account, or manage the accounts that you own.

About this task

To view account properties or manage accounts that you own, select the **Access** tab and click **Accounts**. Then, you can select the account that you want to work with in the account table.

Deleting an account

You can delete an account only if you are the owner of the account, and only when the account is not associated with any active instances.

Procedure

1. In the account table, select the account you want to delete.
2. Click the **Delete** icon and confirm the deletion.

Clearing or archiving events

From the Events tab, you can see events such as instance completion, instance failure, new account requests, and new accounts created. You can also clear or archive events. Clearing an event deletes it. Archiving an event saves it to an archive folder. By clearing events, you can free space on your system and improve performance in the IBM Cloud Manager with OpenStack self-service portal. Archive any events that you might want to reference in the future.

About this task

To clear or archive an event, follow these steps:

Procedure

1. In the self-service portal, select **Reports** > **Events**.
   - To clear an event, click **Clear**.
   - To archive an event, click **Archive**.
2. Use the Events filter to select a subset of events to clear or archive. Filter by severity or start and end date. If you filter by date, you must provide an end date.
   - To clear the selected events, click **Clear**.
   - To archive the selected events, click **Archive**. The archived events are saved to a file called `events_<current time in milliseconds>.csv`. This file is in the `archives` folder, which is in the self-service portal configuration directory.

Viewing capacity statistics

Using the Capacity view, you can identify the current capacity of the resources in your virtualization environment. Understanding the capacity of resources within the cloud helps you gauge the health of the entire cloud. It also helps you determine suitable targets to which you might deploy instances.

The **Capacity** tab shows the total, allocated available resources of a host or resource pool, including the number of virtual processors, memory, and storage size. The usage rate shows the real-time metrics of hosts and virtual machines, like processor, memory, storage usage, available storage size, disk I/O requests, network I/O packets, and more.

To access the Capacity view, click the **Reports** tab and then select **Capacity** from the left navigation.

Used This field shows a summary of all allocated resources, regardless of the state of the guest operating system.

Physical
This field shows the physical capacity.

The color of the capacity indicator can be green or yellow. Green indicates that the used resources are less than the physical resources. Yellow indicates that the used resource is overcommitted on the available physical resources, but you can still deploy.

You can also access the individual instance to see the target deployment grid that displays live metrics for the resources you want to deploy or migrate.

Notes:

1. The allocated processors and memory that is displayed for a IBM PowerVC host might not match the actual allocation in the PowerVC environment. This is because the IBM Cloud Manager with OpenStack appliance environment with OpenStack does not support fractional processor units and manages only resources that are owned by the Storage Connectivity Group that is defined in the PowerVC driver configuration.
2. The physical capacity for processors and memory that is displayed for a PowerVC host does not include resources that are reserved in the PowerVC environment.
3. The Capacity view does not display storage data for PowerVC clouds.

Managing with OpenStack dashboard

Use this information if you are managing your cloud using the OpenStack dashboard, which is based on OpenStack Horizon. The IBM Cloud Manager with OpenStack dashboard is intended for administrator use only.

If you choose, you can use the OpenStack dashboard to manage your cloud environment. After you install and deploy IBM Cloud Manager with OpenStack, access the dashboard. From a supported browser, type `https://controller.fqdn.com/`, where **`controller.fqdn.com`** is the fully qualified domain name of the controller node in your topology.

You can log in using the *admin* user with the password that you customized for your deployment. If you deployed the `Minimal` topology, then the default password is *admin*. For more information about users and passwords, see the “User names and passwords” on page 263 and “Data bags” on page 277 topics.

You can configure some of the properties in the dashboard as well. For specific configuration options, see “Configuring IBM Cloud Manager with OpenStack dashboard properties” on page 204.

The OpenStack dashboard is based on OpenStack Horizon. For information about the OpenStack dashboard, see Horizon: The OpenStack Dashboard Project.

Copying images from one OpenStack region to another

You can copy an image that is stored in the image repository of one OpenStack region to the image repository in another region.

About this task

An image consists of the following information:

- A disk image
- Image metadata that is stored in the OpenStack image repository (Glance)
- Image configuration data that is stored in the IBM Cloud Manager with OpenStack self-service portal database

OpenStack provides APIs and command line interfaces that can be used to copy images from one image repository to another.

- OpenStack Image Service APIs can be used to list images, retrieve and upload images.
- The **`openstack image`** command (**`create`**, **`list`**, **`save`**, **`set`** and **`show`** subcommands) and **`glance`** command **(`image-create`**, **`image-download`**, **`image-list`**, **`image-show`** and **`image-update`** subcommands) provide command line interfaces to the Image Service APIs.
- The OpenStack dashboard provides image management capabilities.

IBM Cloud Manager with OpenStack self-service portal provides APIs and graphical interfaces for working with images. The self-service portal manages some properties in the OpenStack image metadata that must be kept in sync with data stored in the self-service portal database. For this reason, images that are used with the self-service portal cannot be copied using the same technique as copying OpenStack images.

The self-service portal does not provide features for copying images from one region to another or copying image configuration data from one cloud image to another.

Copying a self-service portal image

Use these instructions to copy an image that is used by the IBM Cloud Manager with OpenStack self-service portal from one region to another.

About this task

To copy an image that is used by the self-service portal in region *r1* to region *r2*, use the following procedure. The examples assume that the file `openrc` contains credentials for authenticating to region *r1*. This file could be the openrc file that is installed on the region *r1* controller.

Procedure

1. View the original image in the self-service portal and note the following properties:
   - **Name**: *myimage*
   - **UUID**: *90a8c085-5014-4a19-9001-3593f0389582*
   - **Disk format**: *QCOW2*
   - **Container Format**: *BARE*
   - **Minimum memory**: *0*
   - **Minimum storage**: *0*
   - **Additional Properties**:
     - **architecture:**: *x86_64*
     - **hypervisor_type**: *qemu*
2. Extract the image file for the image. You can extract the image file by using OpenStack APIs or CLI from any system. For convenience, the glance **`image-download`** CLI on the region *r1* controller is used in this example.

   ```
   # . openrc
   # glance image-download --file myimage.img 90a8c085-5014-4a19-9001-3593f0389582
   ```

   Note: If you already have the image file, for example, from importing the original image into the self-service portal, you do not need to extract the image.
3. If necessary, transfer the image file to the system where your web browser is running or to a system where you have HTTP access to the image file.
4. From the self-service portal, go to the **Image** tab to import the image. Select the cloud for region *r2*. Then, enter the path or URL to the image file and the other information that you collected in the first step of this process.
5. Using the self-service portal, edit the new image and set other properties to match the original image. The additional properties might include information such as the image configuration and deployment strategy.

Copying OpenStack Glance images

Use these instructions to copy OpenStack Glance images from one region to another.

About this task

If you have access to the image files and you already know information such as the container format and disk format, you can create those images in region two. If the file is accessibly using HTTP, you can use the OpenStack dashboard to create a new image. Otherwise, you can use the **`glance image-create`** command to create the image. The following example assumes that you are logged on to the region two controller and that you have copied the image file, `test_image.img`, to that system:

Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

```
# . openrc
# glance image-create --name='test image' --is-public=true --container-format=bare --disk-format=qcow2 <
test_image.img
```

If the image files are stored in the region one glance repository or you are not sure of the image properties, use the following procedure to copy OpenStack cloud images from region *r1* to region *r2*. The examples assume that the files `openrc.r1` and `openrc.r2` contain credentials for authenticating to regions *r1* and *r2* respectively.

Procedure

1. Access the environment file for the first region by using the following command.

   ```
   # . openrc.r1
   ```

2. List the images in the first region and identify those that you want to copy.

   ```
   # openstack image list
   ```

   ```
   +--------------------------------------+------------+
   | ID                                   | Name       |
   +--------------------------------------+------------+
   | f3b35877-f182-4cb5-a69c-bc3b40a4feb3 | test image |
   +--------------------------------------+------------+
   ```

3. Display the properties for the image:

   ```
   # openstack image show -f shell "test image"
   ```

   ```
   checksum="d972013792949d0d3ba628fbe8685bce"
   container_format="bare"
   created_at="2014-12-08T20:51:26.066496"
   deleted="False"
   deleted_at="None"
   disk_format="qcow2"
   id="f3b35877-f182-4cb5-a69c-bc3b40a4feb3"
   is_public="True"
   min_disk="0"
   min_ram="0"
   name="test image"
   owner="e17e12ef8219460abeaf1075cbaabbd5"
   properties="{}"
   protected="False"
   size="13147648"
   status="active"
   updated_at="2014-12-08T20:54:24.441587"
   virtual_size="None"
   ```

4. Note the highlighted items in the previous step. The highlighted parameters are used in the **`openstack image create`** command. If the **`properties`** field has a value, it must be split into sets of key value pairs. For example:

   ```
   properties="{u'key2': u'value2', u'key1': u'value1'}"
   ```

   The preceding values correspond to the following key value pairs:

```
"key2" "value2"
"key1" "value1"
```

5. Save the image file on the region two controller:

   ```
   # openstack image save --file test_image.img "test image"
   ```

6. Access the environment file for the second region by using the following command.

   ```
   # . openrc.r2
   ```

7. Create the image in region *r2*:

   Note: The following command must be entered on a single line, even though the example shows a line break for formatting purposes.

   ```
   # openstack image create  --container-format bare --disk-format=qcow2 --public --file test_image.img
   "test image"
   ```

   If the image has properties set, use the **`--property key=value`** option to set each option. For example:

   ```
   --property key1=value1 --property key2=value2
   ```

   Note: You can use **`glance help`** or **`openstack help`** to get more information about OpenStack CLI commands for working with images in the OpenStack image repository.

Results

The glance repository in region *r2* should now contain copies of the images from region *r1* including their metadata.

Backing up and restoring IBM Cloud Manager with OpenStack

To protect your IBM Cloud Manager with OpenStack data, you must back up critical files in case the server enters an undesired state. Before you back up your data, determine the circumstances in which you intend to restore your data.

Backing up and restoring the deployment server

While there are many techniques for backing up and restoring servers, the following procedure backs up the minimal set of data needed for a successful recovery.

How you choose to back up the deployment server data varies depending on how you deployed the deployment server and the backup and recovery strategy and infrastructure of your organization. Regardless of the technique that is chosen, it is important to test both your backup and restore processes.

Backing up the deployment server

1. Make a directory to copy the backup data. This directory can be anything that you choose, but you must ensure that it has enough disk space to hold the backup data. The commands in this document use the following directory:

   ```
   mkdir /tmp/backup
   ```

2. If you changed the Chef server configuration files, you must back up your changes. IBM Cloud Manager with OpenStack sets these values during installation; therefore, no changes are typically required. If you used a response file for installation, you must backup the response file and keep it with your backups so it can be used to reinstall IBM Cloud Manager with OpenStack.

   ```
   cp ~/cmwo_install.rsp /tmp/backup
   ```

3. Back up the certificates of the webserver.

   ```
   mkdir /tmp/backup/nginx
   cp -a /var/opt/chef-server/nginx/ca /tmp/backup/nginx/ca
   ```

4. Back up the bookshelf data.

```
mkdir /tmp/backup/bookshelf
cp -a /var/opt/chef-server/bookshelf/data /tmp/backup/bookshelf/data
```

5. Back up the postgres database. The **pg_dump** command produces a consistent backup even if the server processes are running.

   ```
   mkdir /tmp/backup/database

   su - opscode-pgsql
   pg_dump -c opscode_chef > /tmp/chefserver.sql
   exit

   cp /tmp/chefserver.sql /tmp/backup/database
   ```

6. Back up your topology, node attribute, and encrypted data bag, secret key files. By default, these files are in your `/root/your-deployment-name` directory.

   ```
   cp -a /root/your-deployment-name /tmp/backup/
   ```

7. Back up the `/root/.chef/knife.rb` file.

   ```
   cp /root/.chef/knife.rb /tmp/backup
   ```

8. Back up the server SSL certificate.

   ```
   cp /root/.chef/os-management-server.pem /tmp/backup
   ```

9. If you are using identity files rather than passwords, back up identity files of the node. The location depends on your configuration. When you deployed the node, you needed to specify either the node's password or identity file in your topology files. Check your topology files to see whether you used identity files and find their locations.
10. If you customized the `file-repo` or the `yum-repo`, back up those changes.
11. Compress the `/tmp/backup` directory and store in a safe location.

    ```
    zip -r backup /tmp/backup
    ```

Restoring the deployment server

Start with a clean system and do the following:

1. Retrieve your backup archive file that you want to restore and extract it to `/tmp/backup`.

   ```
   unzip backup.zip
   ```

2. Install IBM Cloud Manager with OpenStack. Use the response file if you used one during the initial installation.
3. Apply any IBM Cloud Manager with OpenStack fix packs.
4. Apply any `file-repo` or `yum-repo` changes that were made or restore those changes from the backup archive file.
5. Restore the postgres database.

   ```
   /opt/chef-server/embedded/bin/psql -U opscode-pgsql opscode_chef
   < /tmp/backup/database/chefserver.sql
   ```

6. Stop the server processes.

   ```
   chef-server-ctl stop
   ```

7. Restore the bookshelf data.

   ```
   cp -a /tmp/backup/bookshelf/data/* /var/opt/chef-server/bookshelf/data/
   ```

8. Restore chef configuration data.

   ```
   cp -a /tmp/backup/nginx/ca /var/opt/chef-server/nginx
   ```

9. Restore the `knife.rb` file.

   ```
   cp -a /tmp/backup/knife.rb /root/.chef/
   ```

10. Restore the certificate of the webserver.

    ```
    cp -a /tmp/backup/os-management-server.pem /root/.chef
    ```

11. Restore your topology, node attribute, and data bag encryption, secret key files.

    ```
    cp -a /tmp/backup/your-deployment-name /root
    ```

12. If you are using identity files rather than passwords, restore the identity files of the node. The location depends on your configuration.
13. Restart the chef server.

    ```
    chef-server-ctl start
    ```
14. Reindex the chef server.

    ```
    chef-server-ctl reindex
    ```

Your deployment server restore is now complete.

Backing up and restoring the OpenStack databases

The backup procedure is different depending on the database that is being used.

Backing up database data for recovery

All of the database data that is related to IBM Cloud Manager with OpenStack users, such as projects, networks, instances, images, are stored in the database. The backup procedure is different depending on the database that is being used.

1. Stop the IBM Cloud Manager with OpenStack services to ensure that the backup data is complete.
2. Follow the instructions that pertain to your specific database.

   MySQL

   For more information, see Backup and Recovery in the OpenStack community documentation.

   DB2 OpenStack database

   DB2 can also be used to host the OpenStack databases on the cloud controller. The following shell script backs up a list of DB2 OpenStack databases. This shell script must be modified to match the environment. The variable *DB* is where the DB2 program is located. The variable *DBLIST* is a list of OpenStack databases to back up. The variable *DBBACKUPDIR* is a directory to save the backups in. Since this shell script quiesces each database, while this shell script runs, calls to these databases fail. The backup directory contains the backup files that appear similar to the following example: `NOVA.0.db2inst1.DBPART000.20140523134214.001` The following shell script is an example DB2 OpenStack database backup script:

   ```
   #!/bin/bash
   ##########################################################
   # DB2 OpenStack DB backup Linux shell script
   # MODIFY these variables to fit your environment
   #    DB2 - home directory of DB2
   #    DBLIST - list of Openstack DB to be backed up
   #    DBBACKUPDIR - directory holding backed up copies
   ##########################################################
   DB2="/opt/ibm/db2/V10.5/bin/db2"
   DBLIST="nova glance"
   DBBACKUPDIR="/tmp/DB2backupOpenstack"

   mkdir -p $DBBACKUPDIR
   for DB in $DBLIST
   do
   su - db2inst1 <<EOSU
   echo "------DB $DB is being backed up ------"
   $DB2 connect to $DB
   $DB2 quiesce database immediate force connections
   $DB2 connect reset
   echo $DB2 backup database $DB to $DBBACKUPDIR without prompting
   $DB2 backup database $DB to $DBBACKUPDIR without prompting
   $DB2 connect to $DB
   $DB2 unquiesce database
   $DB2 connect reset
   EOSU
   done
   ```

For more information, see Backup and Recovery in the OpenStack community documentation.

Restoring the DB2 OpenStack databases

DB2 can also be used to host the OpenStack databases on the cloud controller. The following shell script can restore a DB2 OpenStack database. This shell script must be modified to match the environment. The variable *DB2* is where the DB2 program is located. The variable *DBBACKUPDIR* is a directory where the backup files are located. The Variable *DB* is the OpenStack database to restore. The variable *DBBACKUPTIME* is the time stamp part of the backup file name, found in the backup directory. Since this shell script quiesces each database, while this shell script runs, calls to these databases fail. Here is an example DB2 OpenStack database restore shell script:

```
#!/bin/bash
###############################################################
# DB2 OpenStack DB restore Linux shell script
# MODIFY these variables to fit your environment
#    DB2HOME - home directory of DB2
#    DB - database name to be restored
#    DBBACKUPDIR - directory holding backed up copies
#    DBBACKUPTIME - timestamp part of backupname
#        example : 20140522162140
###############################################################
DB2="/opt/ibm/db2/V10.5/bin/db2"
DBBACKUPDIR="/tmp/DB2backupOpenstack"
DB="nova"
DBBACKUPTIME="20140523135648"

su - db2inst1 <<EOSU
$DB2 connect to $DB
$DB2 quiesce database immediate force connections
$DB2 connect reset
echo $DB2 restore database $DB from $DBBACKUPDIR taken at $DBBACKUPTIME without prompting
$DB2 restore database $DB from $DBBACKUPDIR taken at $DBBACKUPTIME without prompting
$DB2 connect to $DB
$DB2 unquiesce database
$DB2 connect reset
EOSU
```

For more information, see Backup and Recovery in the OpenStack community documentation.

Backing up and restoring the self-service portal

To protect your self-service portal data, you must back up critical files in case the server enters an undesired state. Before you back up your data, determine the circumstances in which you intend to restore your data.

Backing up self-service portal data for recovery

There are two kinds of data to back up. The first set of data is for server configuration and the second set of data is used by the database. When you consider what data to back up, review both sets of data.

Note: This procedure backs up the self-service portal only. It does not back up the underlying virtualization managers, such as VMware vCenter or storage devices.

1. Stop the IBM Cloud Manager with OpenStack server to ensure that the backup data is complete.
2. Back up the following configuration files.
   - The `.SCE42` folder.
   - In the `installation` folder: `skc.ini`

     Note: If any values are changed in this file, you must back up the updated file after you change default values.

A copy of all these files is required to ensure a complete backup.

Backing up database data for recovery

All of the database data that is related to IBM Cloud Manager with OpenStack users, such as projects, networks, instances, images, are stored in the database. The backup procedure is different depending on the database that is being used.

1. Stop the IBM Cloud Manager with OpenStack server to ensure that the backup data is complete.
2. Follow the instructions that pertain to your specific database.

   Derby database

   If you are using the Derby database, backup the `.SCE42/database folder` that stores all the database data.

   DB2 database

   If DB2 is configured, backup the database in the DB2 server. For more information about how to back up the DB2 server, see the DB2 product information.

   Note: Ensure that the information referenced matches the version of DB2 that you are using. If not, reference the appropriate support documentation for similar information.

Restoring the server

To restore a backup of the server and the Derby database, copy all the saved files back to the original server. After the copy is complete, start the IBM Cloud Manager with OpenStack server.

If you are using the DB2 database, there are some extra steps.

1. Ensure the path that is specified in the `database.properties` configuration file, by the property *database.db2.path*, is correct.

```
# If db2 then the path to the DB2 dtatbase needs to be provided. This will be ignored for derby.
#database.db2.path=//localhost:50000/cfs:.
```

Essentially, creating a backup of the entire `home` folder and `skc.ini` file ensures a complete backup of the IBM Cloud Manager with OpenStack server. Copying the files back to their original location restores the data.

Important: There is a limitation to be aware of when you use this best practice. Any incremental data that occurs after backing up the IBM Cloud Manager with OpenStack server is lost after you restore the server. Therefore, some functions might not work as expected. For example, consider the circumstance where you create an instance after you complete a capture, and then you restore the server. The IP address that was assigned to the instance (after the backing up) is still available in the IP address pool. It might be assigned to another instance.

Chapter 8. Security

IBM Cloud Manager with OpenStack offers security options such as secure sockets layer (SSL), Lightweight Directory Access Protocol (LDAP), and user administration. This section provides information on managing passwords that are associated with the security options.

Passwords

IBM Cloud Manager with OpenStack uses keys to encrypt and decrypt passwords and other sensitive information. If using the self-service portal, there is a protected file named `cfs.keystore` that stores the randomly-generated Data Encryption Standard (DES) key that IBM Cloud Manager with OpenStack uses.

The following list provides links to various sections in this document that describe default passwords and places where passwords are entered and stored in IBM Cloud Manager with OpenStack.

- "Customizing passwords and secrets" on page 114
- Chapter 3, "Installing and uninstalling IBM Cloud Manager with OpenStack," on page 21
- "Configuring secure shell (SSH) communication" on page 164
- "Configuring REST API authentication" on page 169
- "Configuring database" on page 170
- "Configuring global image deployment" on page 173
- Set secure access during deployment (Linux on VMware)
- "Creating a configuration strategy" on page 186
- "Configuring the default administrator user account and changing password" on page 211
- "Configuring LDAP authentication using the web interface" on page 212
- "Adding a network configuration" on page 238

Port usage

The number of ports that IBM Cloud Manager with OpenStack uses depends upon the various components and which network interfaces allow access to them.

The following tables list the default ports that might apply to your IBM Cloud Manager with OpenStack environment, depending upon your configuration. You can change these values to customize them for your environment as well.

Table 60. Port usage for IBM Cloud Manager with OpenStack single controller

Port	Service	Notes
22	sshd	SSH access that uses the customer network can be enabled.
67	DHCP server	
68	DHCP server	
80	openstack-dashboard-server	Provides access to the Horizon dashboard.
443	openstack-dashboard-server	Provides https access to the Horizon dashboard.
5000	openstack-identity-api	
35357	openstack-identity-admin	

Table 60. Port usage for IBM Cloud Manager with OpenStack single controller (continued)

Port	Service	Notes
5671	openstack-messaging-server	
6080	openstack-compute-novnc	
8000	openstack-orchestration-api-cfn	
8003	openstack-orchestration-api-cloudwatch	
8004	openstack-orchestration-api	
8774	openstack-compute-api	
8776	openstack-block-storage-api	
8777	openstack-telemetry-api	
9191	openstack-image-registry	
9292	openstack-image-api	
9696	openstack-network-api	
9973	ibm-openstack-iaas-gateway	
27017	openstack-database-nosql	DB2 NoSQL wire protocol listener for access to ceilodb2 database
50000	openstack-database-server	

Table 61. Port Usage - IBM Cloud Manager with OpenStack self-service portal

Port	Service	Notes
7777	sce	OSGi console, access from localhost only
18080	sce	HTTP port
18443	sce	HTTPS port

Table 62. Port usage - Compute nodes

Port	Service	Notes
22	ssh	SSH port. This port must be accessible from the Chef server.
5900 - 5999	vnc-server	Only applicable to KVM/QEMU or PowerKVM compute nodes.

Table 63. Port usage - Chef server

Port	Notes
1443	The secure (HTTPS) port for accessing the Chef server. The port number is configurable.
1480	The non-secure (HTTP) port for accessing the Chef server. The port number is configurable.

User names and passwords

The following default user names and passwords are included with IBM Cloud Manager with OpenStack.

Default user names and passwords

Table 64. OpenStack credentials

User name	Password	Default data bag item (that contains the password)	Description
ceilodb2	ceilodb2 (minimal topology) and ceilometer (controller +*n* compute or distributed database topology)	db_passwords/ ceilometer	Used for internal communication to Ceilometer database.
cinder	cinder	db_passwords/cinder	Used for internal communication to the Cinder database.
glance	glance	db_passwords/glance	Used for internal communications to the Glance database.
heat	heat	db_passwords/heat	Used for internal communications to the Heat database.
dash	horizon	db_passwords/horizon	Used for internal communications to the Horizon database.
keystone	keystone	db_passwords/keystone	Used for internal communications to the Keystone database.
neutron	neutron	db_passwords/neutron	Used for internal communications to the Neutron database.
nova	nova	db_passwords/nova	Used for internal communications to the Nova database.
powervc	powervc	db_passwords/powervc	Used for internal communications to the PowerVC driver database.
admin	admin (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/admin	OpenStack and (if installed) the self-service portal administrator user.
ceilometer	openstack-ceilometer	service_passwords/ openstack-ceilometer	OpenStack service user for Ceilometer.
cinder	openstack-block-storage	service_passwords/ openstack-block-storage	OpenStack service user for Cinder.
glance	openstack-image	service_passwords/ openstack-image	OpenStack service user for Glance.
heat	openstack-orchestration	service_passwords/ openstack-orchestration	OpenStack service user for Heat.
neutron	openstack-network	service_passwords/ openstack-network	OpenStack service user for Neutron.
nova	openstack-compute	service_passwords/ openstack-compute	OpenStack service user for Nova.

Table 64. OpenStack credentials (continued)

User name	Password	Default data bag item (that contains the password)	Description
powervc	openstack-powervc-driver	service_passwords/ openstack-powervc-driver	OpenStack service user for PowerVC driver.
gwagent	openstack-iaas-gateway	service_passwords/ openstack-iaas-gateway	OpenStack service user for IaaS gateway.
db2das1	db2das1 (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/db2das1	DB2 administrator user.
db2fenc1	db2fenc1 (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/ db2fenc1	DB2 fenced user.
db2inst1	db2inst1 (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/db2inst1	DB2 instance user.
heat_stack_ admin	openstack1	user_passwords/ heat_stack_admin	Keystone user with roles sufficient to manage users and projects in the **stack-user-domain**.
mysqlroot	openstack1 (controller +*n* compute or distributed database topology)	user_passwords/ mysqlroot	MySQL root user.
qpidadmin	qpidadmin (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/ qpidadmin	Qpid administrator user. Used for communication with the Qpid messaging server.
qpidclient	qpidclient (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/ qpidclient	Qpid client user. Used for communication with the Qpid messaging server.
qpidssl	qpidssl (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/qpidssl	Qpid SSL user. Used for communication with the Qpid messaging server.

Table 64. OpenStack credentials (continued)

User name	Password	Default data bag item (that contains the password)	Description
rabbitclient	rabbitclient (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/ rabbitclient	RabbitMQ client user. Used for communication with the RabbitMQ messaging server.
sceagent	sceagent (minimal topology) openstack1 (controller +*n* compute or distributed database topology)	user_passwords/sceagent	IBM Cloud Manager with OpenStack self-service portal user. Used to set up the IaaS Gateway and add an OpenStack cloud.

If you deployed a controller +n compute or distributed database topology, you can use the following command to download and decrypt the data bags that contain the passwords and secrets for your deployment. The information is stored in the `data_bags` directory. The directory also contains a passwords and secrets JSON file, `your-environment-name_passwords_file.json`, that summarizes the passwords and secrets for your deployment. Ensure that you remove the `data_bags` directory when you are done using it.

```
$ knife os manage get passwords --topology-file your-topology-name.json data_bags
```

Note: You can customize all passwords when you deploy a topology. For more information about customizing passwords when deploying a topology, see “Customizing passwords and secrets” on page 114. For more information about changing passwords after a topology is deployed, see “Changing passwords and secrets” on page 147.

Strengthening security

If you are using Keystone authentication and must comply with enhanced security requirements, ensure you are using the correct configuration settings.

Token hash algorithms

The default hash algorithm to use for PKI tokens is `md5`, which might not be adequate.

You can set any algorithm that the Python standard library's `hashlib` function supports by configuring the `hash_algorithm` option in the **`[token]`** section of the `keystone.conf` file. The **`auth_token`** middleware must be configured with the same `hash_algorithm` value as well. The token hash algorithm should be a minimum of `SHA2`. If you set the value to *sha256*, you provide a `SHA2` hash that is adequate for most standards.

Disable the s3 extension

The s3 extension is enabled by default. You must disable the extension.

To disable, remove the `s3_extension` from the pipeline. This is in the `/etc/keystone/api-paste.ini` file.

Remove **`s3_extension`** from the following options:

- `[pipeline:admin_api]`
- `[pipeline:api_v3]`

Chapter 9. Reference

The following topics provide reference information for IBM Cloud Manager with OpenStack.

Commands

IBM Cloud Manager with OpenStack offers a command-line interface.

Refer to the following commands and their descriptions. For instructions to use the command, open a command line and enter **`--help`**. For example, **`knife os manage deploy topology --help`**. To assist in analyzing problems with the commands, enter **`-VV`** to obtain debug level information. For example, **`knife os manage deploy topology simple_topology.json -VV`**. You can also review the sample topology file, keys, and descriptions provided by IBM Cloud Manager with OpenStack.

Note: For information about the OpenStack command line interface, see OpenStack Command-Line Interface Reference in the OpenStack community documentation.

Table 65. Commands and descriptions

Command	Description
`knife os manage deploy evaluation [NODE_FQDN] (options)` where: • **`NODE_FQDN`** is the host fully qualified domain name or IP address for the node. The fully qualified domain name (FQDN) of the node is optional. However, if it is not specified, you are prompted for it and it defaults to the FQDN of the host the command is running on. The command also prompts for the SSH root user password of the node being deployed to.	Used to deploy an evaluation node.
`knife os manage deploy node NODE_FQDN RUN_LIST_ENTRY[,RUN_LIST_ENTRY] (options)` where: • **`NODE_FQDN`** is the host fully qualified domain name or IP address for the node. • **`RUN_LIST_ENTRY`** is a comma-separated list of run list items such as roles, and recipes. If the run list entries are specified, they are set on the node. Otherwise, they are not required.	Used to deploy a single node.
`knife os manage deploy topology TOPOLOGY_FILE_NAME (options)` where: • **`TOPOLOGY_FILE_NAME`** is a JSON file that describes the topology. If the topology file is in the current directory, only the topology file name is required, otherwise, the fully qualified topology file name is accepted as well.	Used to deploy a topology.
`knife os manage update node NODE_FQDN [RUN_LIST_ENTRY[,RUN_LIST_ENTRY]] (options)` where: • **`NODE_FQDN`** is the host fully qualified domain name or IP address for the node. • **`RUN_LIST_ENTRY`** is a comma-separated list of run list items such as roles, and recipes. If the run list entries are specified, they are set on the node. Otherwise, they are not required.	Used to update or refresh a single node.

Table 65. Commands and descriptions (continued)

Command	Description
`knife os manage remove node NODE_FQDN -–topology-file TOPOLOGY_FILE --secret-file SECRET_FILE (options)` where: • **`NODE_FQDN`** is the fully qualified domain name of a node that was deployed. • **`TOPOLOGY_FILE`** is the name of the topology JSON file that describes a topology that was already deployed. • **`SECRET-FILE`** is the secret file that is used to encrypt the passwords and secrets. A secret file is required for this command. If this option is not specified, the example data bag secret file that is found in the IBM Cloud Manager with OpenStack Chef repository is used.	Used to remove a compute node from a deployed topology.
`knife os manage validate node NODE_FQDN` where: • **`NODE_FQDN`** is the fully qualified domain name of a node system.	Used to validate a node prior to deployment.
`knife os manage update topology TOPOLOGY_FILE_NAME (options)` where: • **`TOPOLOGY_FILE_NAME`** is a JSON file that describes the topology. If the topology file is in the current directory, only the topology file name is required, otherwise, the fully qualified topology file name is accepted as well.	Used to update or refresh a topology.
`knife os manage set environment [ENVIRONMENT_NAME] (options)` where: • **`ENVIRONMENT_NAME`** is the name of a new environment to create, or an existing environment to modify. New environments are created based on one of the existing example environments that are stored in the IBM Cloud Manager with OpenStack Chef repository. By default, the command prompts for several environment values, and when done, saves the environment that is created or modified on the Chef server. You can use the `–env-config` option in an environment YAML configuration file to enter environment changes instead of using the command line. After the environment is updated, it can be used to deploy or update a single node or a topology. The **`ENVIRONMENT_NAME`** field is optional. If it is not provided, the command prompts for one.	Used to create a new, or modify an existing Chef environment that is used during a topology or node deployment.
`knife os manage set topology [TOPOLOGY_FILE_NAME] (options)` where: • **`TOPOLOGY_FILE_NAME`** is the name of a new topology JSON file to create. The command prompts for all of the information that is required to deploy a topology of nodes. The resulting JSON file is saved to the current directory, and can then be used to deploy a topology using the knife **`os manage deploy topology`** command.	Used to create a new topology JSON file that can be used during the deployment of a topology. One of the required topology items is the environment name. If you enter a new environment name in this command while entering the topology information results in the **`knife os manage set environment`** command being called automatically to create the new environment and upload it to the Chef server when it is complete. Thus, this command can be used to create a new environment, and upload to the chef server, as well as, create a new topology JSON file in one step.

Table 65. Commands and descriptions (continued)

Command	Description
knife os manage appliance migrate node NODE_FQDN (options) where: • **NODE_FQDN** is the host fully qualified domain name of the controller node.	Used to migrate the data and configuration from a IBM SmartCloud Entry 3.2 appliance to a IBM Cloud Manager with OpenStack single control node.
knife os manage set passwords --secret-file SECRET_FILE -E ENVIRONMENT[.json] --topology-file TOPOLOGY_FILE [PASSWORDS_FILE] where: • **SECRET_FILE** is the secret file that is used to encrypt the passwords and secrets. A secret file is required for this command. If this option is not specified, the example data bag secret file that is found in the IBM Cloud Manager with OpenStack Chef repository is used. If the secret file does not exist, it is created. • **ENVIRONMENT[.json]** is the environment that is updated with the new passwords and secrets. This option is required and can either be the name of the environment on the Chef server or the environment JSON file. • **TOPOLOGY_FILE** is the topology JSON file that is updated to reference the secret file that is used by this command. • **PASSWORDS_FILE** is the passwords and secrets JSON file. If not specified, all passwords and secrets are randomly generated. If specified, the file contains the passwords and secrets that the caller wants to set for the specified data bags and data bag items. A subset of all passwords and secrets can be set in this file. If a password or secret is not set or its value is set to *RANDOM*, then a random password is generated. An example passwords and secrets JSON file can be found in the IBM Cloud Manager with OpenStack Chef repository.	Used to set passwords and secrets for a new topology deployment.
knife os manage get passwords --secret-file SECRET_FILE -E ENVIRONMENT --topology-file TOPOLOGY_FILE [DATA_BAGS_DIRECTORY] where: • **SECRET_FILE** is the secret file that is used to encrypt the passwords and secrets for the deployment. The default value is the example data bag secret file that is found in the IBM Cloud Manager with OpenStack Chef repository. If this option is not specified and the **TOPOLOGY_FILE** option is specified, the secret file that is specified by the topology JSON file is used. • **ENVIRONMENT** is the environment that is used for the deployment. If this option is not specified and the **TOPOLOGY_FILE** option is specified, the environment that is specified by the topology JSON file is used. • **TOPOLOGY_FILE** is the topology JSON file for the deployment. If the **SECRET_FILE** option is not specified, then the secret file that is specified by this topology JSON file is used. If the **ENVIRONMENT** option is not specified, then the environment that is specified by this topology JSON file is used. • **DATA_BAGS_DIRECTORY** is the directory that is created to store the data bags and data bag items that contain the passwords and secrets for the deployment. If this option is not specified, the 'data_bags' directory is used.	Used to get passwords and secrets for a topology deployment.

Table 65. Commands and descriptions (continued)

Command	Description
knife os manage update passwords --secret-file SECRET_FILE -E ENVIRONMENT --topology-file TOPOLOGY_FILE [DATA_BAGS_DIRECTORY] where: • **SECRET_FILE** is the secret file that is used to encrypt the passwords and secrets for the deployment. The default value is the example data bag secret file found in the IBM Cloud Manager with OpenStack Chef repository. If this option is not specified and the **TOPOLOGY_FILE** option is specified, the secret file that is specified by the topology JSON file is used. • **ENVIRONMENT** is the environment that is used for the deployment. If this option is not specified and the **TOPOLOGY_FILE** option is specified, the environment that is specified by the topology JSON file is used. • **TOPOLOGY_FILE** is the topology JSON file for the deployment. If the **SECRET_FILE** option is not specified then the secret file that is specified by this topology JSON file is used. If the **ENVIRONMENT** option is not specified then the environment specified by this topology JSON file is used. • **DATA_BAGS_DIRECTORY** is the directory containing the data bags and data bag items with the updated passwords and secrets for the deployment. If this option is not specified the 'data_bags' directory is used.	Used to update passwords and secrets for a topology deployment.
knife os manage encrypt password [PASSWORD] where **PASSWORD** is the clear text password to encrypt. If **PASSWORD** is not entered, you are prompted to enter the password.	Used to encrypt a clear text password for use in a topology JSON, passwords JSON, or cloud YAML file.
knife os manage services ACTION --node NODE_FQDN --topology-file TOPOLOGY_FILE where: • **ACTION** is the action to perform on the OpenStack services. Valid values are start, stop, restart, enable, disable, and status. • **NODE_FQDN** is the fully qualified domain name of a node that was deployed. • **TOPOLOGY_FILE** is the name of the topology JSON file that describes a topology that was already deployed. Either the *-node* option or the *–topology-file* option is required, but both cannot be specified.	Used to start, stop, restart, disable, enable, and obtain status from the OpenStack services that are running on a particular node or topology.
knife os manage deploy cloud CLOUD_FILE_NAME where *CLOUD_FILE_NAME* is the full path and file name of the cloud YAML configuration file.	Used to deploy a cloud topology.

Topology JSON file

View a sample layout found in the topology JSON file.

A topology JSON looks similar to the following layout:

```
{
    "name":"Topology1",
    "description":"This is a topology",
    "environment":"os-single-controller-n-compute",
    "secret_file":"data_bags/example_data_bag_secret",
    "run_sequentially":false,
    "concurrency":10,
    "nodes": [
        {
            "name": "controller",
            "description": "This is the controller node",
            "fqdn":"controllername.company.com",
            "password":"passw0rd",
            "run_order_number":1,
            "quit_on_error":true,
            "chef_client_options": [
                "-i 3600",
                "-s 600"
            ],
            "runlist": [
                "role[ibm-os-single-controller-node]"
            ]
        },
        {
            "name": "KVM qemu compute",
            "description": "This is a KVM qemu compute node",
            "fqdn":"computename.company.com",
            "user":"admin",
            "identity_file":"/root/identity.pem",
            "run_order_number":2,
            "allow_update": false,
            "runlist": [
                "role[ibm-os-compute-node-kvm]"
            ],
            "attributes":"{\"openstack\":{\"compute\":{\"libvirt\":{\"virt_type\":\"qemu\"}}}}"
        }
    ]
}
```

Table 66. Topology Keys

Topology Keys	Description
name	A user-defined name of the topology.
description	A user-defined description of the topology.
environment	The environment to use with all nodes in the topology. The environment must be on the chef server.
secret_file	The secret file that contains the symmetric key for encrypted data bags. This file is only required if encrypted data bags are used to store the OpenStack passwords.
run_sequentially	An optional flag that is used to control how nodes in a node **run_order_number** run. Set to *true* to run each node sequentially. Set to *false* to run all nodes in a **run_order_number** in parallel. The default value is *false*.
concurrency	An optional integer value that is used to specify the maximum number of nodes that can run in parallel if **run_sequentially** is set to *false*. If not set, all nodes in with a **run_order_number** run in parallel, without limit. The default is there is no limit on the number of nodes that can run in parallel.
nodes	A list of nodes in the topology. At least one node is required

Table 67. Node Keys

Node Keys	Description
name	A user-defined name of the node.
description	A user-defined description of the node.
fqdn	The host fully qualified domain name or IP address of the node.
chef_node_name	The optional setting for the node's name on the Chef server. This setting defaults to the fully qualified domain name value of the node if not explicitly set.

Table 67. Node Keys (continued)

Node Keys	Description
user	The ssh user of the node. This setting defaults to *root*.
password	The ssh user password of the node. This might be used in place of **identity_file**. Either the password, or the **identity_file** are required for ssh access. The password value can be either plain text, or encrypted. Encrypted passwords are written by the **os manage set topology** command when it is used to build the topology JSON file.
identity_file	The identity file that contains the ssh private key. This file might be used in place of password for ssh access. Either the password, or the **identity_file** are required for ssh access to the node.
run_order_number	Each node has an optional **run_order_number** setting that is an integer value greater than or equal to zero. The default **run_order_number** value, if not specified, is zero. The **run_order_number** is used to group one or more nodes to be deployed together as a collection of nodes. If the topology setting of **run_sequentially** is not specified or is set to false, all nodes with a given **run_order_number** are run in parallel as a group. If the topology setting of **run_sequentially** is set to *true*, all nodes with **run_order_number** are run sequentially as a group. The numbers are processed by the smallest one first, and the largest one last. When a **run_order_number** is processed, all nodes with that **run_order_number** are deployed in parallel or sequentially, depending on the topology **run_sequentially** setting. Within a given **run_order_number**, nodes with different environment values must be bootstrapped sequentially, but nodes with the same environment value can be bootstrapped in parallel. All nodes within a given **run_order_number** deploy (**run chef_client**) in parallel after all nodes in the **run_order_number** are bootstrapped. The default value is *zero*.
quit_on_error	Each node has an optional **quit_on_error** boolean value that defaults to *false*. The **quit_on_error** setting applies to a given **run_order_number**. If set to *true*, any node with that **run_order_number** causes the run to stop on failure at the end of the run. Flow would not continue to the next **run_order_number** set of nodes. If any of the nodes within a given **run_order_number** has its **quit_on_error** value set to *true*, then the process stops at the end of the run, and does not proceed to the set of nodes in the next **run_order_number**. The default value is *false*.
chef_client_options	An optional list of run options to be passed to the chef-client program run on the node.
runlist	The run list for the node. The run list is a list of roles or cookbook recipes to be applied to the node. The roles and cookbook recipes must be on the Chef server.
attributes	The optional JSON attribute string to pass to the node during the deploy or update process. The attributes that are specified in the JSON string are applied when the chef-client is run on the node during a deploy or update operation.
attribute_file	The optional fully qualified path and file name of an attribute JSON file to use in place of the attributes setting. The attributes in the JSON file are applied when the chef-client is run on the node during a deploy or update operation. Either **attribute_file** or attributes can be specified, but not both.
allow_update	An optional Boolean value that is used during updates only that indicates whether a node should be updated. Set to *true* to allow the node to be updated. Set to *false* if the node should not be updated. The default is *true*.

The following settings are required topology settings.

- The following topology keys are required during a topology deploy operation. The other keys are optional.

  ```
  environment
  ```

- The following node keys are required for each node during a topology deploy operation. The other keys are optional.

```
fdqn
runlist
either the password or the identity_file.
```

- None of the topology keys are required during a topology update operation.
- The following node keys are required for each node during a topology update operation. The other keys are optional.

```
fdqn
either the password or the identity_file.
```

Cloud YAML configuration file

A cloud YAML configuration file is used as the base structure for your cloud deployment. An example cloud YAML configuration file is included here.

A cloud YAML configuration file looks similar to the following:

```
# ==================================================================
# Cloud Information
# ==================================================================
cloud:
  # Cloud Name: The cloud name must not contain spaces or special
  # characters. The name is used for the OpenStack region name.
  name: MyCloudName
  # Cloud Description
  description: Controller + N Compute Topology - x86 KVM
  # Cloud Administrator (admin) User's Password
  password: MyCloudPassword
  # Cloud Database Service Type: db2 or mysql
  database_service_type: db2
  # Cloud Messaging Service Type: rabbitmq or qpid
  messaging_service_type: rabbitmq
  # Cloud Features: The cloud features to be enabled or disabled.
  features:
    self_service_portal: enabled
    platform_resource_scheduler: enabled
  # Cloud Topology: References the node name(s) for each role
  # within the cloud's topology.
  topology:
    database_node_name: controller
    controller_node_name: controller
    self_service_portal_node_name: controller
    kvm_compute_node_names: kvm_compute

# =================================================================
# Environment Information
# =================================================================
environment:
  base: example-ibm-os-single-controller-n-compute
  default_attributes:
  # (Optional) Add Default Environment Attributes

  override_attributes:
  # (Optional) Add Override Environment Attributes


# =================================================================
# Node Information
# =================================================================
nodes:
  - name: controller
    description: Cloud controller node
    fqdn: controllername.company.com
    password: passw0rd
    identity_file: ~
    nics:
      management_network: eth0
      data_network: eth1
  - name: kvm_compute
    description: Cloud KVM compute node
    fqdn: kvmcomputename.company.com
    password: ~
    identity_file: /root/identity.pem
    nics:
      management_network: eth0
      data_network: eth1
    # (Optional) Node Attribute JSON File
    attribute_file: ~
```

Cloud YAML Configuration Keys

This information describes the cloud configuration keys that are used in the cloud YAML configuration file.

Table 68. Cloud YAML Configuration Keys

Key	Description
cloud	The cloud information section.
cloud.name	The user-defined name for the cloud. The cloud name must not contain spaces or special characters. The name is used for the OpenStack region name.
cloud.description	The optional user-defined description for the cloud.
cloud.password	The optional user-defined password for the cloud administrator (*admin*) user. If not specified, a randomly generated password is used unless **cloud.password_file** is specified. The **os manage get passwords** command can be used to determine the password generated.
cloud.password_file	The optional user-defined passwords and secrets JSON file containing the passwords and secrets for the cloud topology. If **cloud.password** is also set then it will override the cloud administrator (*admin*) user's password in the file. Any passwords or secrets not set by **cloud.password** or **cloud.password_file** are randomly generated. The **os manage get passwords** command can be used to determine the passwords and secrets generated.
cloud.database_service_type	The database used by OpenStack. Set to *db2* to use DB2 or *mysql* to use MySQL.
cloud.messaging_service_type	The message queue used by OpenStack. Set to *rabbitmq* to use RabbitMQ or *qpid* to use Qpid.
cloud.features	The cloud features section.
cloud.features.self_service_portal	IBM Cloud Manager with OpenStack features an easy to use self-service portal for performing cloud operations. Set to *enabled* to enable this feature. If not set or set to *disabled*, this features is disabled. When the feature is disabled, then **cloud.topology.self_service_portal_node_name** must be set to ~.
cloud.features.platform_resource_ scheduler	IBM Cloud Manager with OpenStack features an enhanced OpenStack compute scheduler, IBM Platform Resource Scheduler (PRS). Set to *enabled* to enable this feature. If not set or set to *disabled*, the default OpenStack compute scheduler filters are used.
cloud.topology.database_node_name	The name of the node (**nodes.name**) that runs the IBM Cloud Manager with OpenStack database service.
cloud.topology.controller_node_name	The name of the node (**nodes.name**) that runs the IBM Cloud Manager with OpenStack single controller node services.
cloud.topology.self_service_portal_ node_name	If **cloud.features.self_service_portal** is enabled, this is the name of the node that runs the IBM Cloud Manager with OpenStack self-service portal.

Table 68. Cloud YAML Configuration Keys (continued)

Key	Description
cloud.topology.kvm_compute_ node_names	The name of the nodes (**nodes.name**) that run the IBM Cloud Manager with OpenStack KVM/QEMU compute node services. These node names are only required when deploying a cloud environment with KVM/QEMU compute nodes. One or more nodes can share the same name. Remove the key or set to ~ when not required for your cloud environment.
cloud.topology.powerkvm_ compute_node_names	The name of the nodes (**nodes.name**) that run the IBM Cloud Manager with OpenStack PowerKVM compute node services. These node names are only required when deploying a cloud environment with PowerKVM compute nodes. One or more nodes can share the same name. Remove the key or set to ~ when not required for your cloud environment.
cloud.topology.powervc_ driver_node_name	The name of the node (**nodes.name**) that runs the IBM Cloud Manager with OpenStack PowerVC Driver services. This node name is only required when deploying a cloud environment to manage to PowerVC. Remove the key or set to ~ when not required for your cloud environment.
environment	The environment information section.
environment.base	The name of the base Chef environment, found in the IBM Cloud Manager with OpenStack Chef repository, that is used to create the Chef environment for the cloud.
environment.default_attributes	The optional list of Chef environment default attributes to set. The attributes must be specified by using the same syntax as the “Environment YAML Configuration File” on page 276.
environment.override_attributes	The optional list of Chef environment override attributes to set. The attributes must be specified by using the same syntax as the “Environment YAML Configuration File” on page 276.
nodes	The nodes information section.
nodes.name	The user-defined name of the node. One or more nodes can share the same name. This node name is used by the **cloud.topology.*** keys to reference the node.
nodes.description	A user-defined description of the node.
nodes.fqdn	The fully qualified domain name of the host or IP address of the node.
nodes.password	The SSH user password of the node. Either **nodes.password** or **nodes.identity_file** is required for SSH access. Set to ~ to use **nodes.identity_file**.
nodes.identity_file	The SSH identity file of the node. Either **nodes.password** or **nodes.identity_file** is required for SSH access. Set to ~ to use **nodes.password**.
nodes.nics	The nodes network interface cards section.
nodes.nics.management_network	The name of the network interface card used for IBM Cloud Manager with OpenStack communication between the nodes in the cloud. The **fqdn** setting for the node must resolve to the IP address of this network.
nodes.nics.data_network	The optional name of the network interface card used for the virtual machine data network of the cloud. It is only required if you use VLAN or Flat networks in your cloud. Set to ~ if the node does not have a second network interface card. Do not set to the same value as **nics.management_network** for the node. Also, do not set to a network interface card that provides an alternative management network for the node, for example, a private or public IP address.
nodes.attribute_file	The optional name of an attribute JSON file to use in place of the attributes setting. The attributes in the JSON file are applied the first-time chef-client is run on the node.

Table 68. Cloud YAML Configuration Keys (continued)

Key	Description
powervc	The PowerVC information section.
powervc.host	The fully qualified domain name or IP address of PowerVC.
powervc.admin_user	The PowerVC administrator's user name.
powervc.admin_password	The PowerVC administrator's password.
powervc.messaging_service _auto_config	IBM Cloud Manager with OpenStack can automatically configure the PowerVC message queue for your cloud. Set to *enabled* to enable this feature. If not set or set to *disabled*, the PowerVC message queue must be manually configured and **powervc.messaging_service_type** and **powervc.messaging_service_password** must be set.
powervc.messaging_service_type	The message queue used by PowerVC. Set to *rabbitmq* to use RabbitMQ or *qpid* to use Qpid. This is ignored if **powervc.messaging_service_auto_config** is enabled.
powervc.messaging_service_ password	The PowerVC message queue service's password. This is ignored if **powervc.messaging_service_auto_config** is enabled.
powervc.storage_connectivity_groups	The PowerVC storage connectivity groups that you want to make available in your cloud. Add one storage connectivity group per line.

Environment YAML Configuration File

An environment YAML configuration file looks similar to the following example:

```
default_attributes:
  openstack.attribute_test.string           : "test"
  openstack.attribute_test.string_no_quotes : test
  openstack.attribute_test.integer          : 14
  openstack.attribute_test.boolean          : true
  openstack.attribute_test.nothing          :

  # This is one string and not an array of strings
  openstack.attribute_test.array_strings    : zero, one, two

  # Arrays of strings
  openstack.attribute_test.array_strings_1  : ["zero", "one", "two"]
  openstack.attribute_test.array_strings_2  : [zero, one, two]
  openstack.attribute_test.array_strings_3  :
    - zero
    - one
    - two
  # This is one string and not an array of strings
  openstack.attribute_test.array_strings_4  :
    - zero, one, two

  # Array of integers
  openstack.attribute_test.array_integers   : [0, 1, 2, 3]
  openstack.attribute_test.array_integers_1 :
    - 0
    - 1
    - 2
    - 3

override_attributes:
  openstack.network.openvswitch.tenant_network_type     : "gre"
  openstack.network.openvswitch.bridge_mappings         : ""
  openstack.network.openvswitch.network_vlan_ranges     : ""
  openstack.network.openvswitch.bridge_mapping_interface: ""
  openstack.network.ml2.tenant_network_types            : "gre"
  openstack.network.ml2.network_vlan_ranges             : ""
  openstack.network.ml2.flat_networks                   : ""
# This is optional. It is used to set the environment's description.
env_description:
  input_validation     : string
  default              : Daryl's environment with direct attributes
  enabled              : true
```

This file is used by the **os manage set environment** command. The file contains the default and override attributes to set in the environment. In addition, the file might optionally contain the description to set for the environment.

Passwords and secrets JSON file

The passwords and secrets JSON file is used by the **os manage deploy cloud** command and the **os manage set passwords** command. An example passwords and secrets JSON file is included here.

A passwords and secrets JSON file looks similar to the following:

```
{
  "user_passwords": {
    "admin": "my_admin_password",
    "rabbitclient": "my_rabbitclient_password"
  }
}
```

When the **os manage deploy cloud** command or the **os manage set passwords** command is run, the command accesses the passwords and secrets JSON file. The file contains the passwords and secrets that the caller wants to set for the specified data bags and data bag items. A subset of all passwords and secrets can be set in this file. If a password or secret is not set or its value is set to RANDOM, then a random password is generated. This file only supports the passwords and secrets that are found in the Data bags topic.

After the passwords and secrets are set for a deployment with the **os manage deploy cloud** command or the **os manage set passwords** command, you can generate the passwords and secrets JSON file by using the **os manage get passwords** command. The generated file contains the actual password values that you set for the deployment.

Data bags

The following example data bags are provided in support of the IBM Cloud Manager with OpenStack topologies.

These data bags contain passwords and secrets for your cloud operating environments running IBM Cloud Manager with OpenStack. By default, all data bags are encrypted using the example secret key that is provided with your IBM Cloud Manager with OpenStack installation (`/opt/ibm/cmwo/chef-repo/data_bags/example_data_bag_secret`).

- db_passwords
- secrets
- service_passwords
- user_passwords

db_passwords

Contains IBM Cloud Manager with OpenStack database passwords for your deployment. By default, all passwords match the data bag item name.

- **ceilometer**: Database password for the telemetry component.
- **cinder**: Database password for the block-storage component.
- **glance**: Database password for the image component.

- **heat**: Database password for the orchestration component.
- **horizon**: Database password for the dashboard component.
- **keystone**: Database password for the identity component.
- **neutron**: Database password for the network component.
- **nova**: Database password for the compute component.
- **powervc**: Database password for the PowerVC driver component.

secrets

Contains IBM Cloud Manager with OpenStack secrets. By default, all secrets match the data bag item name except, **openstack_simple_token**.

- **neutron_metadata_secret**: Metadata secret for the network component.
- **openstack_identity_bootstrap_token**: Bootstrap token for the identity component.
- **openstack_metering_secret**: Metering secret for the telemetry component.
- **openstack_simple_token**: Simple token for the IBM Cloud Manager with OpenStack identity component. The secret must be a base64 encoded value. To generate a secret, run the following command:

  ```
  dd if=/dev/urandom bs=16 count=1 2>/dev/null | base64
  ```
- **openstack_vmware_secret_name**: Secret for the VMware driver.

service_passwords

Contains IBM Cloud Manager with OpenStack service user passwords. By default, all passwords match the data bag item name.

- **openstack-block-storage**: Cinder service user password for the block-storage component.
- **openstack-ceilometer**: Ceilometer service user password for the telemetry component.
- **openstack-compute**: Nova service user password for the compute component.
- **openstack-image**: Glance service user password for the image component.
- **openstack-network**: Neutron service user password for the network component.
- **openstack-orchestration**: Heat service user password for the orchestration component.
- **openstack-iaas-gateway**: IaaS gateway service user password for the iaas-gateway component.
- **openstack-powervc-driver**: PowerVC driver service user password for the PowerVC driver component.

user_passwords

Contains IBM Cloud Manager with OpenStack user passwords. This includes passwords for the IBM Cloud Manager with OpenStack administrator along with the Qpid, RabbitMQ, DB2, and MySQL users. By default, all passwords are *openstack1*.

- **admin**: Password for the OpenStack *admin* user and the IBM Cloud Manager with OpenStack self-service portal *admin* user.
- **db2inst1**: Password for the DB2 *db2inst1* user.
- **db2das1**: Password for the DB2 *db2das1* user.
- **db2fenc1**: Password for the DB2 *db2fenc1* user.
- **heat_stack_admin**: Keystone password for *stack_domain_admin* user.
- **mysqlroot**: Password for MySQL root user.
- **qpidadmin**: Password for the Qpid *qpidadmin* user.
- **qpidclient**: Password for the Qpid *qpidclient* user.
- **qpidssl**: Password for the Qpid *qpidssl* certificate user.
- **rabbitclient**: Password for the RabbitMQ *rabbitclient* user.
- **pvcadmin**: Password for the PowerVC *admin* user.
- **pvcqpid**: Password for the PowerVC Qpid *powervc_qpid* user.
- **pvcrabbit**: Password for the PowerVC RabbitMQ *powervcdriver_mq* user.

- **sceagent**: Password for the IBM Cloud Manager with OpenStack self-service portal *sceagent* user.
- **xcat**: Password for the z/VM xcat *admin* user.
- **xcatmnadmin**: Password for the z/VM xcat *mnadmin* user.
- **zlinuxroot**: Password for the instances that are created by z/VM *root* user.

Mapping attributes to services

The following environment and node attributes are mapped to specific options for IBM Cloud Manager with OpenStack services.

Qpid messaging service attributes

Review mappings for the Qpid messaging service attributes

Table 69. Qpid messaging service attributes

Attribute	File	Option
qpid.broker.max-connections	/etc/qpid/qpidd.conf	max-connections
qpid.broker.connection-backlog	/etc/qpid/qpidd.conf	connection-backlog
qpid.broker.worker-threads	/etc/qpid/qpidd.conf	worker-threads
qpid.broker.interface	/etc/qpid/qpidd.conf	interface

OpenStack identity service attributes

Review mappings for the OpenStack identity service attributes.

Table 70. OpenStack identity service attributes

Attribute	File	Section	Option
openstack.identity.verbose	/etc/keystone/keystone.conf	DEFAULT	verbose
openstack.identity.debug	/etc/keystone/keystone.conf	DEFAULT	debug
openstack.identity.public_workers	/etc/keystone/keystone.conf	DEFAULT	public_workers
openstack.identity.admin_workers	/etc/keystone/keystone.conf	DEFAULT	admin_workers

OpenStack image service attributes

Review mappings for the OpenStack image service attributes

Table 71. OpenStack image service attributes

Attribute	File	Section	Option
openstack.image.verbose	• /etc/glance/glance-api.conf • /etc/glance/glance-cache.conf • /etc/glance/glance-registry.conf • /etc/glance/glance-scrubber.conf	DEFAULT	verbose
openstack.image.debug	• /etc/glance/glance-api.conf • /etc/glance/glance-cache.conf • /etc/glance/glance-registry.conf • /etc/glance/glance-scrubber.conf	DEFAULT	debug
openstack.image.filesystem_store_datadir	/etc/glance/glance-api.conf	DEFAULT	filesystem_store_datadir
openstack.image.api.workers	/etc/glance/glance-api.conf	DEFAULT	workers
openstack.image.registry.workers	/etc/glance/glance-registry.conf	DEFAULT	workers

OpenStack block storage service attributes

Review mappings for the OpenStack block storage service attributes.

Table 72. OpenStack block storage service attributes

Attribute	File	Section	Option
openstack.block-storage.no_snapshot_gb_quota	/etc/cinder/cinder.conf	DEFAULT	use_default_quota_class
openstack.block-storage.quota_driver	/etc/cinder/cinder.conf	DEFAULT	quota_driver
openstack.block-storage.quota_gigabytes	/etc/cinder/cinder.conf	DEFAULT	quota_gigabytes
openstack.block-storage.quota_snapshots	/etc/cinder/cinder.conf	DEFAULT	quota_snapshots
openstack.block-storage.quota_volumes	/etc/cinder/cinder.conf	DEFAULT	quota_volumes
openstack.block-storage.use_default_quota_class	/etc/cinder/cinder.conf	DEFAULT	use_default_quota_class
openstack.block-storage.verbose	/etc/cinder/cinder.conf	DEFAULT	verbose
openstack.block-storage.debug	/etc/cinder/cinder.conf	DEFAULT	debug
openstack.block-storage.iscsi_ip_address	/etc/cinder/cinder.conf	DEFAULT	iscsi_ip_address
openstack.block-storage.san.san_ip	/etc/cinder/cinder.conf	DEFAULT	san_ip
openstack.block-storage.san.san_login	/etc/cinder/cinder.conf	DEFAULT	san_login

Table 72. OpenStack block storage service attributes (continued)

Attribute	File	Section	Option
openstack.block-storage.san.san_private_key	/etc/cinder/cinder.conf	DEFAULT	san_private_key
openstack.block-storage.storwize.storwize_svc_volpool_name	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_volpool_name
openstack.block-storage.storwize.storwize_svc_vol_rsize	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_rsize
openstack.block-storage.storwize.storwize_svc_vol_warning	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_warning
openstack.block-storage.storwize.storwize_svc_vol_autoexpand	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_autoexpand
openstack.block-storage.storwize.storwize_svc_vol_grainsize	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_grainsize
openstack.block-storage.storwize.storwize_svc_vol_compression	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_compression
openstack.block-storage.storwize.storwize_svc_vol_easytier	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_easytier
openstack.block-storage.storwize.storwize_svc_flashcopy_timeout	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_flashcopy_timeout
openstack.block-storage.storwize.storwize_svc_vol_iogrp	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_vol_iogrp
openstack.block-storage.storwize.storwize_svc_connection_protocol	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_connection_protocol
openstack.block-storage.storwize.storwize_svc_iscsi_chap_enabled	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_iscsi_chap_enabled
openstack.block-storage.storwize.storwize_svc_multipath_enabled	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_multipath_enabled
openstack.block-storage.storwize.storwize_svc_multihostmap_enabled	/etc/cinder/cinder.conf	DEFAULT	storwize_svc_multihostmap_enabled
openstack.block-storage.ibmnas.nas_ip	/etc/cinder/cinder.conf	DEFAULT	nas_ip
openstack.block-storage.ibmnas.nas_login	/etc/cinder/cinder.conf	DEFAULT	nas_login
openstack.block-storage.ibmnas.nas_ssh_port	/etc/cinder/cinder.conf	DEFAULT	nas_ssh_port
openstack.block-storage.ibmnas.shares_config	/etc/cinder/cinder.conf	DEFAULT	nfs_shares_config
openstack.block-storage.ibmnas.mount_point_base	/etc/cinder/cinder.conf	DEFAULT	nfs_mount_point_base
openstack.block-storage.ibmnas.nfs_sparsed_volumes	/etc/cinder/cinder.conf	DEFAULT	nfs_sparsed_volumes
openstack.block-storage.gpfs.gpfs_mount_point_base	/etc/cinder/cinder.conf	DEFAULT	gpfs_mount_point_base
openstack.block-storage.gpfs.gpfs_images_dir	/etc/cinder/cinder.conf	DEFAULT	gpfs_images_dir
openstack.block-storage.gpfs.gpfs_images_share_mode	/etc/cinder/cinder.conf	DEFAULT	gpfs_images_share_mode
openstack.block-storage.gpfs.gpfs_sparse_volumes	/etc/cinder/cinder.conf	DEFAULT	gpfs_sparse_volumes
openstack.block-storage.gpfs.gpfs_max_clone_depth	/etc/cinder/cinder.conf	DEFAULT	gpfs_max_clone_depth
openstack.block-storage.gpfs.gpfs_storage_pool	/etc/cinder/cinder.conf	DEFAULT	gpfs_storage_pool
openstack.block-storage.ibmnas.ibmnas_platform_type	/etc/cinder/cinder.conf	DEFAULT	ibmnas_platform_type
openstack.block-storage.osapi_volume_workers	/etc/cinder/cinder.conf	DEFAULT	osapi_volume_workers

OpenStack orchestration service attributes

Review mappings for the OpenStack orchestration service attributes.

Table 73. OpenStack orchestration service attributes

Attribute	File	Section	Option
openstack.orchestration.verbose	/etc/heat/heat.conf	DEFAULT	verbose
openstack.orchestration.debug	/etc/heat/heat.conf	DEFAULT	debug
openstack.orchestration.heat_stack_user_role	/etc/heat/heat.conf	DEFAULT	heat_stack_user_role
openstack.orchestration.stack_user_domain_name	/etc/heat/heat.conf	DEFAULT	stack_user_domain_name
openstack.orchestration.stack_domain_admin	/etc/heat/heat.conf	DEFAULT	stack_domain_admin

OpenStack telemetry service attributes

Review mappings for the OpenStack telemetry service attributes.

Table 74. OpenStack telemetry service attributes

Attribute	File	Section	Option
openstack.telemetry.verbose	/etc/ceilometer/ceilometer.conf	DEFAULT	verbose
openstack.telemetry.debug	/etc/ceilometer/ceilometer.conf	DEFAULT	debug

OpenStack compute service attributes

Review mappings for the OpenStack compute service attributes.

Table 75. OpenStack compute service attributes

Attribute	File	Section	Option
openstack.compute.verbose	/etc/nova/nova.conf	DEFAULT	verbose
openstack.compute.debug	/etc/nova/nova.conf	DEFAULT	debug
openstack.compute.rpc_thread_pool_size	/etc/nova/nova.conf	DEFAULT	rpc_thread_pool_size
openstack.compute.rpc_conn_pool_size	/etc/nova/nova.conf	DEFAULT	rpc_conn_pool_size
openstack.compute.rpc_response_timeout	/etc/nova/nova.conf	DEFAULT	rpc_response_timeout
openstack.compute.state_path	/etc/nova/nova.conf	DEFAULT	state_path
openstack.compute.lock_path	/etc/nova/nova.conf	DEFAULT	lock_path
openstack.compute.instances_path	/etc/nova/nova.conf	DEFAULT	instances_path
openstack.compute.log_dir	/etc/nova/nova.conf	DEFAULT	log_dir
openstack.compute.config.quota_driver	/etc/nova/nova.conf	DEFAULT	quota_driver
openstack.compute.config.quota_cores	/etc/nova/nova.conf	DEFAULT	quota_cores

Table 75. OpenStack compute service attributes (continued)

Attribute	File	Section	Option
openstack.compute.config .quota_instances	/etc/nova/nova.conf	DEFAULT	quota_instances
openstack.compute.config .quota_ram	/etc/nova/nova.conf	DEFAULT	quota_ram
openstack.compute.config .quota_floating_ips	/etc/nova/nova.conf	DEFAULT	quota_floating_ips
openstack.compute.config .quota_fixed_ips	/etc/nova/nova.conf	DEFAULT	quota_fixed_ips
openstack.compute .config.quota_security_groups	/etc/nova/nova.conf	DEFAULT	quota_security_groups
openstack.compute.config .quota_security_groups_rules	/etc/nova/nova.conf	DEFAULT	quota_security_groups_rules
openstack.compute.config .quota_metadata_items	/etc/nova/nova.conf	DEFAULT	quota_metadata_items
openstack.compute.config .quota_injected_files	/etc/nova/nova.conf	DEFAULT	quota_injected_files
openstack.compute. config.quota_injected_file _path_length	/etc/nova/nova.conf	DEFAULT	quota_injected_file_path_length
openstack.compute .config.quota_injected _file_content_bytes	/etc/nova/nova.conf	DEFAULT	quota_injected_file_content_bytes
openstack.compute.config .quota_key_pairs	/etc/nova/nova.conf	DEFAULT	quota_key_pairs
openstack.compute.libvirt .virt_type	/etc/nova/nova.conf	libvirt	virt_type
openstack.compute.osapi _compute_workers	/etc/nova/nova.conf	DEFAULT	osapi_compute_workers
openstack.compute .metadata_workers	/etc/nova/nova.conf	DEFAULT	metadata_workers
openstack.compute .conductor.workers	/etc/nova/nova.conf	conductor	workers
openstack.region	/etc/nova/nova.conf	DEFAULT	os_region_name
openstack.compute. libvirt.live_migration_flag	/etc/nova/nova.conf	libvirt	live_migration_flag
openstack.compute. vif_plugging_is_fatal	/etc/nova/nova.conf	DEFAULT	vif_plugging_is_fatal
openstack.compute. vif_plugging_timeout	/etc/nova/nova.conf	DEFAULT	vif_plugging_timeout

OpenStack network service attributes

Review mappings for the OpenStack network service attributes.

Table 76. OpenStack network service attributes

Attribute	File	Section	Option
openstack.network.verbose	/etc/neutron/ neutron.conf	DEFAULT	verbose

Table 76. OpenStack network service attributes (continued)

Attribute	File	Section	Option
openstack.network.debug	• /etc/neutron/neutron.conf • /etc/neutron/metadata_agent.ini • /etc/neutron/dhcp_agent.ini • /etc/neutron/l3_agent.ini • /etc/neutron/lbaas_agent.ini	DEFAULT	debug
openstack.network.rpc_thread_pool_size	/etc/neutron/neutron.conf	DEFAULT	rpc_thread_pool_size
openstack.network.rpc_conn_pool_size	/etc/neutron/neutron.conf	DEFAULT	rpc_conn_pool_size
openstack.network.rpc_response_timeout	/etc/neutron/neutron.conf	DEFAULT	rpc_response_timeout
openstack.network.core_plugin	/etc/neutron/neutron.conf	DEFAULT	core_plugin
openstack.network.service_plugins	/etc/neutron/neutron.conf	DEFAULT	service_plugins
openstack.network.ml2.mechanism_drivers	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2	mechanism_drivers
openstack.network.ml2.type_drivers	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2	type_drivers
openstack.network.ml2.tenant_network_types	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2	tenant_network_types
openstack.network.ml2.flat_networks	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2_type_flat	flat_networks
openstack.network.ml2.network_vlan_ranges	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2_type_vlan	network_vlan_ranges
openstack.network.ml2.tunnel_id_ranges	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2_type_gre	tunnel_id_ranges
openstack.network.ml2.vni_ranges	/etc/neutron/plugins/ml2/ml2_conf.ini	ml2_type_vxlan	vni_ranges
openstack.network.openvswitch.network_vlan_ranges	/etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini	OVS	network_vlan_ranges
openstack.network.openvswitch.enable_tunneling	/etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini	OVS	enable_tunneling
openstack.network.openvswitch.tunnel_type	/etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini	OVS	tunnel_type
openstack.network.openvswitch.tunnel_types	/etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini	AGENT	tunnel_types

Table 76. OpenStack network service attributes (continued)

Attribute	**File**	**Section**	**Option**
openstack.network .openvswitch.tunnel_id_ranges	/etc/neutron/plugins/ openvswitch/ ovs_neutron_plugin.ini	OVS	tunnel_id_ranges
openstack.network .openvswitch.bridge_mappings	/etc/neutron/plugins/ openvswitch/ ovs_neutron_plugin.ini	OVS	bridge_mappings
openstack.network.openvswitch .veth_mtu	/etc/neutron/plugins/ openvswitch/ ovs_neutron_plugin.ini	AGENT	veth_mtu
openstack.network.quota .driver	/etc/neutron/ neutron.conf	QUOTAS	quota_driver
openstack.network.quota .items	/etc/neutron/ neutron.conf	QUOTAS	quota_items
openstack.network.quota .default	/etc/neutron/ neutron.conf	QUOTAS	default_quota
openstack.network.quota .network	/etc/neutron/ neutron.conf	QUOTAS	quota_network
openstack.network.quota .subnet	/etc/neutron/ neutron.conf	QUOTAS	quota_subnet
openstack.network.quota .port	/etc/neutron/ neutron.conf	QUOTAS	quota_port
openstack.network.quota .security_group	/etc/neutron/ neutron.conf	QUOTAS	quota_security_group
openstack.network.quota .security_group_rule	/etc/neutron/ neutron.conf	QUOTAS	quota_security_group _rule
openstack.network.quota.router	/etc/neutron/ neutron.conf	QUOTAS	quota_router
openstack.network.quota.floatingip	/etc/neutron/ neutron.conf	QUOTAS	quota_floatingip
openstack.network.openvswitch. tenant_network_type	/etc/neutron/plugins/ openvswitch/ ovs_neutron_plugin.ini	OVS	tenant_network_type
openstack.network.use_namespaces	/etc/neutron/ dhcp_agent.ini /etc/neutron/l3_agent.ini	DEFAULT	use_namespaces
openstack.network. allow_overlapping_ips	/etc/neutron/ neutron.conf	DEFAULT	allow_overlapping_ips
openstack.network.dhcp.ovs_use_veth	/etc/neutron/ dhcp_agent.ini	DEFAULT	ovs_use_veth
openstack.network.l3. external_network_bridge	/etc/neutron/l3_agent.ini	DEFAULT	external_network_bridge
openstack.network.api_workers	/etc/neutron/ neutron.conf	DEFAULT	api_workers
openstack.network.rpc_workers	/etc/neutron/ neutron.conf	DEFAULT	rpc_workers

IBM OpenStack IaaS gateway attributes

Review mappings for the IBM OpenStack IaaS gateway attributes.

Table 77. IBM OpenStack IaaS gateway attributes

Attributes	File	Section	Option
ibm-openstack.iaas-gateway.logging.verbose	/etc/iaasgateway/iaasgateway.conf	DEFAULT	verbose
ibm-openstack.iaas-gateway.logging.debug	/etc/iaasgateway/iaasgateway.conf	DEFAULT	debug
ibm-openstack-iaas-gateway.ssl.certfile	/etc/iaasgateway/iaasgateway.conf	service	certfile
ibm-openstack-iaas-gateway.ssl.keyfile	/etc/iaasgateway/iaasgateway.conf	service	keyfile
ibm-openstack-iaas-gateway.ssl.ca_certs	/etc/iaasgateway/iaasgateway.conf	service	ca_certs

IBM OpenStack PowerVC driver service attributes

Review mappings for the IBM OpenStack PowerVC driver service attributes.

Table 78. IBM OpenStack PowerVC driver service attributes

Attributes	File	Section	Option
ibm-openstack.powervc-driver.powervc.admin_user	/etc/powervc/powervc.conf	powervc	admin_user
ibm-openstack.powervc-driver.powervc.auth_url	/etc/powervc/powervc.conf	powervc	auth_url
ibm-openstack.powervc-driver.powervc.qpid.host	/etc/powervc/powervc.conf	powervc	qpid_hostname
	/etc/powervc/powervc-neutron.conf	DEFAULT	qpid_hostname

IBM OpenStack z/VM driver service attributes

Review mappings for the IBM OpenStack z/VM driver service attributes.

Table 79. IBM OpenStack z/VM driver service attributes

Attributes	File	Section	Option
ibm-openstack.zvm-driver.xcat.server	/etc/nova/nova.conf	DEFAULT	zvm_xcat_server
	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	zvm_xcat_server
ibm-openstack.zvm-driver.xcat.username	/etc/nova/nova.conf	DEFAULT	zvm_xcat_username
	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	zvm_xcat_username
ibm-openstack.zvm-driver.xcat.zhcp_nodename	/etc/nova/nova.conf	DEFAULT	zhcp_nodename
	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	xcat_zhcp_nodename
ibm-openstack.zvm-driver.xcat.master	/etc/nova/nova.conf	DEFAULT	zvm_xcat_master

Table 79. IBM OpenStack z/VM driver service attributes (continued)

Attributes	File	Section	Option
ibm-openstack.zvm-driver.xcat.mgt_ip	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	xcat_mgt_ip
ibm-openstack.zvm-driver.xcat.mgt_mask	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	xcat_ mgt_mask
ibm-openstack.zvm-driver.diskpool	/etc/nova/nova.conf	DEFAULT	zvm_diskpool
ibm-openstack.zvm-driver.diskpool_type	/etc/nova/nova.conf	DEFAULT	zvm_diskpool_type
ibm-openstack.zvm-driver.zvm_host	/etc/nova/nova.conf	DEFAULT	zvm_host
	/etc/neutron/plugins/zvm/neutron_zvm_plugin.ini	AGENT	zvm_host
ibm-openstack.zvm-driver.host	/etc/nova/nova.conf	DEFAULT	host
ibm-openstack.zvm-driver.user_profile	/etc/nova/nova.conf	DEFAULT	zvm_user_profile
ibm-openstack.zvm-driver .config_drive.inject _password	/etc/nova/nova.conf	DEFAULT	zvm_config_drive _inject_password
ibm-openstack.zvm-driver.scsi_pool	/etc/nova/nova.conf	DEFAULT	zvm_scsi_pool
ibm-openstack.zvm-driver.fcp_list	/etc/nova/nova.conf	DEFAULT	zvm_fcp_list
ibm-openstack.zvm-driver.zhcp_fcp_list	/etc/nova/nova.conf	DEFAULT	zvm_zhcp_fcp_list

Roles

The following roles are provided in support of the reference topologies.

You add one or more of these roles to the run list of a node system. After the roles are run on a node system, the node system provides the described IBM Cloud Manager with OpenStack services.

- `ibm-os-allinone-kvm`
- `ibm-os-single-controller-node`
- `ibm-os-single-controller-powervc-driver`
- `ibm-os-single-controller-distributed-database-node`
- `ibm-os-compute-node-kvm`
- `ibm-os-compute-node-powerkvm`
- `ibm-os-zvm-driver-node`
- `ibm-os-powervc-driver-node`
- `ibm-os-client-node`
- `ibm-os-database-server-node`
- `ibm-sce-node`
- `ibm-os-block-storage-node`

ibm-os-allinone-kvm
Installs and configures all default IBM Cloud Manager with OpenStack services on a single node

system, including the compute node services for the KVM or QEMU hypervisor types. This role combines the `ibm-os-single-controller-node` and `ibm-os-compute-node-kvm` roles to support the minimal topology.

ibm-os-single-controller-node
Installs and configures all default IBM Cloud Manager with OpenStack services on a single controller node system except for the compute node services. This role supports both the minimal and controller +*n* compute topologies.

ibm-os-single-controller-powervc-driver
Installs and configures all default IBM Cloud Manager with OpenStack services on a single controller node system with IBM Cloud Manager with OpenStack PowerVC driver services to provide manage-to PowerVC capabilities. This role combines the `ibm-os-single-controller-node` and `ibm-os-powervc-driver-node` roles to support the controller +*n* compute and distributed database topology.

ibm-os-single-controller-distributed-database-node
This role is similar to the `ibm-os-single-controller-node` role. The only difference is that it does not run the database server service. This role supports the distributed database topology.

ibm-os-compute-node-kvm
Installs and configures the compute node services for the KVM or QEMU hypervisor types.

ibm-os-compute-node-powerkvm
Installs and configures the compute node services for the PowerKVM hypervisor type.

ibm-os-zvm-driver-node
Installs and configures the compute driver services for the z/VM hypervisor type.

ibm-os-powervc-driver-node
Installs and configures the PowerVC driver services to manage-to the PowerVC virtualization manager.

ibm-os-client-node
Installs and configures the command-line client interface. This role is included in the `ibm-os-single-controller-node` role and needs to be used only if you would like another node system to provide a command-line client interface to IBM Cloud Manager with OpenStack.

ibm-os-database-server-node
Installs and configures the database server service. This includes creating the required databases for IBM Cloud Manager with OpenStack. This role supports the distributed database topology.

ibm-sce-node
Installs and configures the IBM Cloud Manager with OpenStack self-service portal. This role supports all topologies. You can manually add this role to the run list for a node.

ibm-os-block-storage-node
Installs and configures a block storage (openstack-cinder-volume) node.

Best practices when using the self-service portal

This section contains some tips and techniques when using the IBM Cloud Manager with OpenStack self-service portal.

IBM Cloud Manager with OpenStack FAQ

The frequently asked questions (FAQ) topic is a list of questions and answers about IBM Cloud Manager with OpenStack.

Q: How do I find my home directory?

A: For Linux, type `echo $HOME` in a command window.

Q: I created a trusted certificate. Why am I still getting an exception that says the connection is untrusted?

A: When the CA is not trusted by clients automatically and you are attempting to access IBM Cloud Manager with OpenStack with the https protocol, an exception is encountered that says the connection is untrusted. You must confirm that the risks are understood and must add an exception to continue. Even with a trusted certificate, when you are using Internet Explorer, a similar exception is likely to occur.

Q: I want to have spaces in my directory name, but it keeps failing when I try to create it. How can I have spaces?

A: If you have spaces in a directory name, then you must have double quotation marks around it as shown in the following example: `sce240_windows_installer.exe -i silent -f "c:\My Directory\installer.properties"`

Q: My user ID is locked! How do I unlock it?

A: If you have three invalid attempts to log in to IBM Cloud Manager with OpenStack in a 24 hour period, your user ID is locked and must be unlocked by an administrator. If your administrator ID becomes locked, you can either wait 24 hours without logging in or restart IBM Cloud Manager with OpenStack and then try logging in again.

Q: How does IBM Cloud Manager with OpenStack store the passwords for local users or clouds?

A: The passwords are encrypted and stored in either property files or a database.

Q: IBM Cloud Manager with OpenStack GUI looks distorted. How can I fix that?

A: See the information in Display issue with Internet Explorer (self-service portal).

Q: I upgraded/installed IBM Cloud Manager with OpenStack, but I'm still seeing the previous version in my browser. How can I fix that?

A: Clear the cache in your browser and try again. You might have to close your browser after you clear the cache and then reopen your browser and try connecting to IBM Cloud Manager with OpenStack again.

Q: My image is not visible in the window. Where is it?

A: Make sure that your image is deployed and that the correct project is specified. If it still is not visible, contact the administrator to ensure that you have access.

Q: The product charges that I set are incorrect or are not updating. What do I do?

A: First of all, verify that the currencies for all configurable products are the same. You cannot mix currencies. To change your currency for a product, see the "Configuring billing" on page 196. Make sure that you are restarting IBM Cloud Manager with OpenStack after saving.

Q: The instances for a user were moved to a different project. Now when the user logs on, he cannot see his instances. How can the user access his instances?

A: The project where the instances were moved might need to be edited to grant the user access to the project. When you have ensured that the user has access to the new project, have the user check again to see whether the instances display.

Q: When updating IBM Cloud Manager with OpenStack to a new release, can I migrate data and configurations from two releases previous to the current release? For example, can I migrate data in IBM Cloud Manager with OpenStack from version 2.2 to version 2.4?

A: No, you must migrate sequentially. For example, migrate from IBM Cloud Manager with OpenStack version 2.2 to version 2.3. Then you can migrate from IBM Cloud Manager with OpenStack version 2.3 to version 2.4.

Q: **Does the IBM Cloud Manager with OpenStack infocollect command support collecting a database log such as DB2?**

A: No, you must check with the administrator of the database and collect the log manually.

Q: **Why does my login fail with the session timing out?**

A: If your user login fails because the session times out, there might be a problem with the timezone setting. Verify that the IBM Cloud Manager with OpenStack server and client time and timezone match. For example, on the server, if the timezone is Coordinated Universal Time +08:00, the time is 11:27. For the client, the timezone is Coordinated Universal Time +07:00, and the time should be 10:27.

Q: **Why can't I access the IBM Cloud Manager with OpenStack GUI page after I start it?**

A: Verify that a firewall is not blocking the http or https port that you accessed. To check whether it worked in the IBM Cloud Manager with OpenStack host, access for example, `http://localhost:18080/cloud/web/login.html` or use the UNIX command **`wget http://localhost:18080/cloud/web/login.html`**.

Using the `screen` command

The **`screen`** command can be used to start or shut down the IBM Cloud Manager with OpenStack server or to access the OSGI console when the server is up and running when running Linux.

For example, enter **`screen`** and then run the command to start the server. After the server is started, type `ctrl+a`, then `d` to disconnect and leave the IBM Cloud Manager with OpenStack server running,

To get back to the IBM Cloud Manager with OpenStack OSGI prompt to perform other actions, such as enabling additional logging, enter `screen -r`.

Using the `nohup` command

On AIX or Linux, if you start a process from the command line and then log off, the processes you started are generally terminated, even if you spawn them as background processes, because each process is sent a hang up signal (`SIGHUP`). The **`nohup`** command allows you to start a process with the hang up signal disabled so that the process is not ended when you log off.

The **`nohup`** command is used frequently for starting services, such as ssh daemon or DB2 instances.

For example, to start IBM Cloud Manager with OpenStack as a background service, run the following command:

```
nohup /opt/ibm/SCE24/skc -nosplash < /dev/null > /dev/null &
```

The options in this command include the following:

-nosplash
Prevents the process from displaying a splash screen.

< /dev/null
Disconnects the process from terminal input. This option can prevent the process from entering a *stopped* state as can sometimes happen when started from the command line on AIX. This option is not needed when starting the command from a shell script.

> /dev/null
Redirects the OSGI console output. For example, you might want to redirect the output to a log file.

& Runs the command as a background process.

Chapter 10. Troubleshooting and support for IBM Cloud Manager with OpenStack

To isolate and resolve problems with your IBM products, you can use the troubleshooting and support information. This information contains instructions for using the problem-determination resources that are provided with your IBM products, including IBM Cloud Manager with OpenStack.

Techniques for troubleshooting problems

Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and how to resolve the problem. Certain common techniques can help with the task of troubleshooting.

The first step in the troubleshooting process is to describe the problem completely. Problem descriptions help you and the IBM technical-support representative know where to start to find the cause of the problem. This step includes asking yourself basic questions:

- What are the symptoms of the problem?
- Where does the problem occur?
- When does the problem occur?
- Under which conditions does the problem occur?
- Can the problem be reproduced?

The answers to these questions typically lead to a good description of the problem, which can then lead you to a problem resolution.

What are the symptoms of the problem?

When starting to describe a problem, the most obvious question is “What is the problem?” This question might seem straightforward; however, you can break it down into several more-focused questions that create a more descriptive picture of the problem. These questions can include:

- Who, or what, is reporting the problem?
- What are the error codes and messages?
- How does the system fail? For example, is it a loop, hang, crash, performance degradation, or incorrect result?

Where does the problem occur?

Determining where the problem originates is not always easy, but it is one of the most important steps in resolving a problem. Many layers of technology can exist between the reporting and failing components. Networks, disks, and drivers are only a few of the components to consider when you are investigating problems.

The following questions help you to focus on where the problem occurs to isolate the problem layer:

- Is the problem specific to one platform or operating system, or is it common across multiple platforms or operating systems?
- Is the current environment and configuration supported?
- Do all users have the problem?
- (For multi-site installations.) Do all sites have the problem?

If one layer reports the problem, the problem does not necessarily originate in that layer. Part of identifying where a problem originates is understanding the environment in which it exists. Take some time to completely describe the problem environment, including the operating system and version, all corresponding software and versions, and hardware information. Confirm that you are running within an environment that is a supported configuration; many problems can be traced back to incompatible levels of software that are not intended to run together or have not been fully tested together.

When does the problem occur?

Develop a detailed timeline of events leading up to a failure, especially for those cases that are one-time occurrences. You can most easily develop a timeline by working backward: Start at the time an error was reported (as precisely as possible, even down to the millisecond), and work backward through the available logs and information. Typically, you need to look only as far as the first suspicious event that you find in a diagnostic log.

To develop a detailed timeline of events, answer these questions:

- Does the problem happen only at a certain time of day or night?
- How often does the problem happen?
- What sequence of events leads up to the time that the problem is reported?
- Does the problem happen after an environment change, such as upgrading or installing software or hardware?

Responding to these types of questions can give you a frame of reference in which to investigate the problem.

Under which conditions does the problem occur?

Knowing which systems and applications are running at the time that a problem occurs is an important part of troubleshooting. These questions about your environment can help you to identify the root cause of the problem:

- Does the problem always occur when the same task is being performed?
- Does a certain sequence of events need to happen for the problem to occur?
- Do any other applications fail at the same time?

Answering these types of questions can help you explain the environment in which the problem occurs and correlate any dependencies. Remember that just because multiple problems might have occurred around the same time, the problems are not necessarily related.

Can the problem be reproduced?

From a troubleshooting standpoint, the ideal problem is one that can be reproduced. Typically, when a problem can be reproduced you have a larger set of tools or procedures at your disposal to help you investigate. Consequently, problems that you can reproduce are often easier to debug and solve.

However, problems that you can reproduce can have a disadvantage: If the problem is of significant business impact, you do not want it to recur. If possible, re-create the problem in a test or development environment, which typically offers you more flexibility and control during your investigation.

- Can the problem be re-created on a test system?
- Are multiple users or applications encountering the same type of problem?
- Can the problem be re-created by running a single command, a set of commands, or a particular application?

Related tasks:

"Searching knowledge bases" on page 296
You can often find solutions to problems by searching IBM knowledge bases. You can optimize your results by using available resources, support tools, and search methods.

Logging tasks

The IBM Cloud Manager with OpenStack log files are a source of information for additional details about IBM Cloud Manager with OpenStack errors.

By default, IBM Cloud Manager with OpenStack creates a log file in the `<home directory>/logs` directory and saves 9 log files of 50 MB each. The latest log file is called `skc-0.log`.

Change logging levels from the OSGi command prompt

The logging levels can be changed dynamically while the server is running by using the **log** command from the IBM Cloud Manager with OpenStack (OSGi) command prompt.

About this task

The logging levels can be changed dynamically while the server is running by using the **log** command from the IBM Cloud Manager with OpenStack (OSGi) command prompt. Changes made using the **log** command are not saved and are only in effect while the server is running. If the server is restarted, the logging levels are reset to their initial values as specified in the `logging.properties` file. For more information about changing these values in the `logging.properties` file, see "Configuring logging" on page 194.

To run the **log** command, follow these steps:

Procedure

1. Access the IBM Cloud Manager with OpenStack OSGi console.
2. At the OSGi command prompt enter `log <action> <action parameters>`, where the following actions are supported:

   help Displays the online help.

   list Lists the available loggers and their current levels.

   setlevel <logger name>=<logger level>
   Sets the specified logger to the specified logging levels. To set more than one logger, separate the logger name=logger level pair with a space.

Results

See the following examples for typical log commands:

```
log help
log list
log setlevel com.ibm.cfs.cloud=finest
log setlevel com.ibm.cfs.cloud=info default=finest
```

The most common log message level that an IBM Cloud Manager with OpenStack administrator might want to change is `com.ibm.cfs.rest.client.internal=FINE`. Changing the message level causes the output of HTTP requests and responses to be sent to and from the OpenStack REST API.

In a production environment, keep a backup of the log files for at least two weeks to help resolve problems that are not reported immediately or that go undetected.

Note: The property file values are not case-sensitive so a property such as `com.ibm.cfs.rest.client.internal=FINE` is the same as `com.ibm.cfs.rest.client.internal=fine`.

Retrieve log and system files

IBM Cloud Manager with OpenStack provides a command-line utility that enables you to gather logs and system information. If IBM Cloud Manager with OpenStack self-service portal and OpenStack are installed in the same node, then both self-service portal and standard OpenStack logs can be collected, otherwise you can collect the former. When you use standard OpenStack logs you do not have to use **`log_config`** to customize the configuration. This tool runs independently of IBM Cloud Manager with OpenStack and is available even when IBM Cloud Manager with OpenStack is not running.

To use the command-line utility, run the following commands:**`infocollect.sh`**

Note: These scripts can be found in the `SELF_SERVICE_PORTAL_INSTALLATION_DIR/program/bin` directory.

The command accepts the following options:

-c Specifies the configuration directory, for example: `SELF_SERVICE_PORTAL_HOME`, where all the IBM Cloud Manager with OpenStack configuration and log files are saved. This argument is mandatory. You must provide an existing directory path. The command exits with an error if the specified directory cannot be found.

-d Specifies the destination directory for the result files. If this argument is used, provide an existing directory path. This command exists with an error if the specified. If this argument is not provided, the `HOME` directory of the caller is used. If the `HOME` directory is not found, for example, the corresponding environment variable is not set correctly, the system `TEMP` directory is used as the default output directory. For example, in Linux `/tmp` is the system `TEMP` directory.

-h Prints usage information.

When this utility is started, the following files are created:

`openStackLog.zip(Optional)`

Contains all of the OpenStack log files:

`*.log` files

`*.gz` files

`sceHome.zip`

Contains all of the IBM Cloud Manager with OpenStack configurations:

`*.properties` files

`*.log` files

`*.udr` files

Billing configurations: `.xml` files under `products/`

All `.xml` and `.txt` files under `SELF_SERVICE_PORTAL_HOME`

`basicSysInfo.txt`

Contains basic OS information:

CPU

Memory

OS name

Note: This information is retrieved by calling OS shell commands, so the results vary depending on the concrete OS.

Example

Collect the configurations in Linux or AIX, logs, and system information, and save the result to the directory of `/tmp/diagnostic`. The `SELF_SERVICE_PORTAL_HOME` is `/var/opt/ibm/.SCE42`.

```
./infocollect.sh -c /var/opt/ibm/.SCE42 -d /tmp/diagnostic
```

Troubleshooting using the OSGi console

Use the Open Services Gateway initiative (OSGi) console to review information about IBM Cloud Manager with OpenStack.

By default, IBM Cloud Manager with OpenStack starts an OSGi command-line console when the IBM Cloud Manager with OpenStack executable is run. You can access the console directly in the command window started by the executable.

You can also run the console in the background and assign a specific port for telnet connections. To assign a port, modify the `skc.ini` file and add an unused port number on a new line after the `-console` option.

```
-console
<port number>
```

For example, to assign port 7777 for telnet connections, change the option to the following:

```
-console
7777
```

To connect to the OSGi console, type the following:

```
telnet localhost 7777
```

Logging chef-client output

You can obtain chef-client logs from the nodes when you use the IBM Cloud Manager with OpenStack commands.

The IBM Cloud Manager with OpenStack commands log chef-client console output that is captured from each node on the Chef server in a central location. The log file name includes the node name, as well as, an integer time stamp. Up to 9 log files are kept for each node in the `/var/log/chef-server/nodes` folder on the Chef server. Each IBM Cloud Manager with OpenStack deployment or update command typically writes 3 log files. One is for the initial **ping** to the node. The second is for the bootstrap, and the final is for the actual chef-client run.

The log file generation can be controlled by two settings in the chef server `/root/.chef/knife.rb` file:

```
knife[:node_log_max_files] = 9
knife[:node_log_path] = '/var/log/chef-server/nodes'
```

These settings default in the IBM Cloud Manager with OpenStack command-line interface code to the preceding values shown above. The preceding values can be set in `knife.rb`, if the defaults are not adequate.

To turn of node logging, set **`knife[:node_log_max_files] = 0`**

Log files are created for each node to which the IBM Cloud Manager with OpenStack command connects. The log file name is `<node_name>_<timestamp>.log`. For example:

```
host.my.company.com_2014-10-23_06-56-24-314222499000.log
```

By default, up to 9 log files are saved for each node.

Logging chef-client output to a log file on the node itself can also be accomplished by specifying chef-client options when you issue one of the IBM Cloud Manager with OpenStack **`os manage deploy`** or **`os manage update`** commands. When chef-client writes to a log file, it does not affect its console output.

To enter the chef-client options on a IBM Cloud Manager with OpenStack CLI 'node' type command, use the `-O` option followed by a string that contains the chef-client options. For example:

```
knife os manage update node host.my.company.com -P passw0rd -O '-l info -L /var/log/chef-client.log'
```

The `-l` chef-client option is the log level (*info* is specified in the preceding example). The `-L` chef-client option is the log file location.

Note: The log file path must exist or an error occurs when the log file is written.

To enter the chef-client options on a IBM Cloud Manager with OpenStack CLI 'topology' type command, use the **`chef-client-options`** JSON key in the topology file that contains a list of chef-client options. For example, the JSON key and value for a node in the topology file might look like the following example:

```
 "chef_client_options": ["-l info", "-L /var/log/chef-client.log"],
```

The preceding options are passed to chef-client to cause it to perform *info* level logging and store the log information in `/var/log/chef-client.log`.

When forcing the chef-client to write to a log file, the output is not the same as that seen on the console. That console output is logged on the chef server as previously mentioned.

Another option to forcing chef-client to write to a log file is to set the following values in the `client.rb` file on the node:

```
log_location "/var/log/chef-client.log"
verbose :info
log_level :info
```

That would cause *info* level logging to occur for all chef-client calls to the log file `/var/log/chef-client.log`.

Note: The chef-client log is not cleared. It is always appended to by chef-client.

Searching knowledge bases

You can often find solutions to problems by searching IBM knowledge bases. You can optimize your results by using available resources, support tools, and search methods.

About this task

You can find useful information by searching the knowledge center for IBM Cloud Manager with OpenStack. However, sometimes you need to look beyond the knowledge center to answer your questions or resolve problems.

Procedure

- Find the content that you need by using the IBM Support Portal.

  The IBM Support Portal is a unified, centralized view of all technical support tools and information for all IBM systems, software, and services. The IBM Support Portal lets you access the IBM electronic support portfolio from one place. You can tailor the pages to focus on the information and resources that you need for problem prevention and faster problem resolution. Familiarize yourself with the IBM Support Portal by viewing the demo videos (https://www.ibm.com/blogs/SPNA/entry/the_ibm_support_portal_videos) about this tool. These videos introduce you to the IBM Support Portal, explore troubleshooting and other resources, and demonstrate how you can tailor the page by moving, adding, and deleting portlets.
- The Techdocs Web site at www.ibm.com/support/techdocs/ provides white papers, technotes, tips, and other documents related to IBM Cloud Manager with OpenStack.

Tip: To locate the information that you need, either select the categories that you want to search or select *All of the Techdocs library* to search all categories. Then enter *IBM SmartCloud Entry* in the **for:** field and click **Search**.

- Search for content on the forum: Forum
- Search for content by using the IBM masthead search. You can use the IBM masthead search by typing your search string into the Search field at the top of any ibm.com® page.
- Search for content by using any external search engine, such as Google, Yahoo, or Bing. If you use an external search engine, your results are more likely to include information that is outside the ibm.com domain. However, sometimes you can find useful problem-solving information about IBM products in newsgroups, forums, and blogs that are not on ibm.com.

  Tip: Include "IBM" and the name of the product in your search if you are looking for information about an IBM product.

Related concepts:

"Techniques for troubleshooting problems" on page 291
Troubleshooting is a systematic approach to solving a problem. The goal of troubleshooting is to determine why something does not work as expected and how to resolve the problem. Certain common techniques can help with the task of troubleshooting.

Related reference:

"Known problems and solutions for an Administrator" on page 312
If you are using IBM Cloud Manager with OpenStack with the *Administrator* role, review theses known problems and solutions that you might encounter.

"Known problems and solutions for a User" on page 335
If you are using IBM Cloud Manager with OpenStack with the *User* role, review theses known problems and solutions that you might encounter.

Getting fixes from Fix Central

You can use Fix Central to find the fixes that are recommended by IBM Support for a variety of products, including IBM Cloud Manager with OpenStack. With Fix Central, you can search, select, order, and download fixes for your system with a choice of delivery options. A IBM Cloud Manager with OpenStack product fix might be available to resolve your problem.

Procedure

To find and install fixes:

1. Obtain the tools that are required to get the fix. If it is not installed, obtain your product update installer. You can download the installer from Fix Central. This site provides download, installation, and configuration instructions for the update installer.
2. Click **Find Product**.
3. Begin typing IBM Cloud Manager with OpenStack in the **Product Selector** field.
4. Select IBM Cloud Manager with OpenStack from the list. For Installed version, select All.
5. Identify and select the fix that is required.
6. Download the fix.
   a. Open the download document and follow the link in the "Download Package" section.
   b. When downloading the file, ensure that the name of the maintenance file is not changed. This change might be intentional, or it might be an inadvertent change that is caused by certain web browsers or download utilities.
7. Apply the fix using the instructions in the readme.txt file that comes with the fix package.

Related concepts:

"Applying fixes and updates for IBM Cloud Manager with OpenStack" on page 39
Updates for IBM Cloud Manager with OpenStack provide fixes to the product.

"Applying fixes and updates for DB2" on page 40
Updates for DB2 provide fixes to the DB2 database server.

"Applying fixes and updates" on page 39
You can apply fixes and updates for the IBM Cloud Manager with OpenStack product.

Contacting IBM Support

IBM Support provides assistance with product defects, answers FAQs, and helps users resolve problems with the product.

Before you begin

After trying to find your answer or solution by using other self-help options such as technotes, you can contact IBM Support. Before contacting IBM Support, your company or organization must have an active IBM software maintenance agreement (SWMA), and you must be authorized to submit problems to IBM. For information about the types of available support, see the Support portfolio topic in the "*Software Support Handbook*": http://www14.software.ibm.com/webapp/set2/sas/f/handbook/offerings.html.

Procedure

To contact IBM Support about a problem:

1. Define the problem, gather background information, and determine the severity of the problem. For more information, see the Getting IBM support topic in the *Software Support Handbook* http://www14.software.ibm.com/webapp/set2/sas/f/handbook/getsupport.html.
2. Gather diagnostic information.
3. Submit the problem to IBM Support in one of the following ways:
   - Online through the IBM Support Portal (http://www.ibm.com/software/support/): You can open, update, and view all of your service requests from the Service Request portlet on the Service Request page.
   - By phone: For the phone number to call in your region, see the Directory of worldwide contacts (http://www.ibm.com/planetwide/) web page.

Results

If the problem that you submit is for a software defect or for missing or inaccurate documentation, IBM Support creates an Authorized Program Analysis Report (APAR). The APAR describes the problem in detail. Whenever possible, IBM Support provides a workaround that you can implement until the APAR is resolved and a fix is delivered. IBM publishes resolved APARs on the IBM Support website daily, so that other users who experience the same problem can benefit from the same resolution.

What to do next

Be prepared to work with the IBM technical-support representative by using IBM Assist On-site, which is a remote-assistance plug-in that you can download to your computer. The IBM technical-support representative can use IBM Assist On-site to view your desktop and share control of your mouse and keyboard. This tool can shorten the time that it takes to identify the problem, collect the necessary data, and solve the problem. For more information, see IBM Assist On-site: http://www.ibm.com/support/assistonsite/.

Exchanging information with IBM

To diagnose or identify a problem, you might need to provide IBM Support with data and information from your system. In other cases, IBM Support might provide you with tools or utilities to use for problem determination.

Sending information to IBM Support

To reduce the time that is required to resolve your problem, you can send trace and diagnostic information to IBM Support.

Procedure

To submit diagnostic information to IBM Support:

1. Open a problem management record (PMR). You can use the Service Request Tool to create a PMR: http://www.ibm.com/support/servicerequest
2. Collect the diagnostic data that you need. Diagnostic data helps reduce the time that it takes to resolve your PMR. Manually collect and compress the required diagnostic information by following the directions that you receive from IBM Support.

   Note: See "Retrieve log and system files" on page 294 for directions on collecting logs and system information for IBM Cloud Manager with OpenStack.
3. Transfer the files to IBM. Use the information on the IBM Enhanced Customer Data Repository (ECuRep) website: http://www.ibm.com/software/support/exchangeinfo.html. While ECuRep is the primary method for uploading data, you can also use one of the following methods to transfer the files to IBM. All of these data exchange methods are described on the ECuRep website as well.
   - The Service Request tool
   - Standard data uploads methods: FTP, HTTP
   - Secure data upload methods: FTPS, SFTP, HTTPS
   - Email

Receiving information from IBM Support

ECuRep is the primary method for exchanging data. However, on occasion, an IBM technical-support representative might ask you to download diagnostic tools or other files. You can use FTP to download these files.

Before you begin

Ensure that your IBM technical-support representative provided you with the preferred server to use for downloading the files and the exact directory and file names to access.

Procedure

To download files from IBM Support:

1. Use FTP to connect to the site that your IBM technical-support representative provided and log in as `anonymous`. Use your email address as the password.
2. Change to the appropriate directory:
   a. Change to the `/fromibm` directory.
      ```
      cd fromibm
      ```
   b. Change to the directory that your IBM technical-support representative provided.
      ```
      cd nameofdirectory
      ```
3. Enable binary mode for your session.

```
binary
```

4. Use the **get** command to download the file that your IBM technical-support representative specified.

```
get filename.extension
```

5. End your FTP session.

```
quit
```

Subscribing to Support updates

To stay informed of important information about the IBM products that you use, you can subscribe to updates.

About this task

By subscribing to receive updates about IBM Cloud Manager with OpenStack, you can receive important technical information and updates for specific IBM Support tools and resources. You can subscribe to updates by using My Notifications:

My Notifications

With My Notifications, you can subscribe to Support updates for any IBM product. (My Notifications replaces My Support, which is a similar tool that you might have used in the past.) With My Notifications, you can specify that you want to receive daily or weekly email announcements. You can specify what type of information you want to receive (such as publications, hints and tips, product flashes (also known as alerts), downloads, and drivers). My Notifications enables you to customize and categorize the products about which you want to be informed and the delivery methods that best suit your needs.

Procedure

To subscribe to My Notifications, complete the following steps:

1. Go to the IBM Support Portal (http://www.ibm.com/software/support/) and sign in by using your IBM ID and password.
2. In the **Notifications** portlet, click **Manage all my subscriptions**, then click the **Subscribe** tab.
3. Click **Other Software**.
4. Select IBM Cloud Manager with OpenStack, then click **Continue**.
   a. Select your preferences for how to receive updates, whether by email, online in a designated folder, or as an RSS or Atom feed.
   b. Select the types of documentation updates that you want to receive, for example, new information about product downloads and discussion group comments.
   c. Click **Submit**.

Results

Until you modify your My Notifications preferences, you receive notifications of updates that you have requested. You can modify your preferences when needed.

Related reference:

Subscribe to My Notifications support content updates

My Notifications for IBM technical support

My Notifications for IBM technical support overview

Troubleshooting errors when deploying or updating topologies

If a topology deployment or update fails, review the log output from the deployment command for more information.

Identify errors, starting at the beginning of the log output. The first error found is typically the most useful. Errors found at the end of the log output might be the result of earlier errors. The following topics might provide additional information to solve the problem. After completing the recommended resolution to the problem, retry the topology deployment or update.

Deployment hangs when running the Open vSwitch recipe

You might encounter a hang during the deployment process if you specified an incorrect value for your controller node's data network.

Symptoms

Your deployment hangs at the following step and you cannot log in to the controller node using the fully qualified domain name that you specified when you deployed the node:

```
Running Recipe openstack-network::openvswitch
```

Resolving the problem

To resolve the problem, complete the following steps.

1. Access the console for your controller node or, if available, log in to the controller node using an alternative management or external network.
2. Delete the Open vSwitch data network bridge that was created during deployment. To do so, run **`ovs-vsctl del-br br-eth0`**, where **`br-eth0`** is the bridge and **`eth0`** is the incorrect value that is specified for your controller node's data network. After the bridge is deleted, log in to the controller node using the fully qualified domain name that you specified when you deployed the node.
3. Update you deployment files with the correct management and data networks. For more information about determining the management and data networks for a node, see the Deploying prerequisites topic.
4. Cancel the hung deployment and then try again.

DB2 database requests fail with SQL1225N

When you deploy a topology with DB2 databases and cloud nodes that have several CPUs, database requests might fail with a `SQL1225N` message.

Symptoms

During deployment, the Chef logs show a failure with a `SQL1225N` message:

```
Error executing action `run` on resource 'execute[grant privilege
to user(dash) on database(horizon)]'
 =================================================================================

 Mixlib::ShellOut::ShellCommandFailed
 ------------------------------------
 Expected process to exit with [0], but received '4'
 ---- Begin output of su - db2inst1 -c "(db2 'connect to horizon') &&
(db2 'grant dbadm on database to user dash') && (db2 'connect reset')" ----
 STDOUT: SQL1225N  The request failed because an operating system process, thread, or
 swap space limit was reached.  SQLSTATE=57049
 STDERR:
 ---- End output of su - db2inst1 -c "(db2 'connect to horizon') &&
(db2 'grant dbadm on database to user dash') && (db2 'connect reset')" ----
```

Causes

Some OpenStack components start multiple worker processes based on the number of CPUs. Each of these processes has its own database connections. When the number of CPUs is large (for example, 32), the database connections might require more memory than is available.

Resolution

The following attributes can be set in the environment to control the number of worker processes.

```
openstack.block-storage.osapi_volume_workers
openstack.compute.conductor.workers
openstack.compute.osapi_compute_workers
openstack.identity.admin_workers
openstack.identity.public_workers
openstack.image.api.workers
openstack.image.registry.workers
```

The default values for these attributes, particularly the compute and identity workers, is based on the number of CPUs and might need to be set to a smaller value. For more information about how to change these attributes, see “Customizing performance attributes” on page 127.

Alternately, you can add physical memory or increase the swap space on the node.

MySQL database requests fail with "Too many connections"

When deploying a topology with MySQL database and cloud nodes that have several CPUs, database requests might fail with a `"Too many connections"` error.

Symptoms

The chef logs from deploy shows a failure like the following:

```
ERROR: database_user[neutron] (openstack-ops-database::openstack-db line 99)
had an error: Mysql::Error: Too many connections
```

Causes

Some OpenStack components start multiple worker processes based on the number of CPUs. Each of these processes has its own database connections. When the number of CPUs is large (for example, 32), the number of database connections might exceed the MySQL maximum connection limit, which is set to 151 connections.

Resolution

The following attributes can be set in the environment to control the number of worker processes.

```
openstack.block-storage.osapi_volume_workers
openstack.compute.conductor.workers
openstack.compute.osapi_compute_workers
openstack.identity.admin_workers
openstack.identity.public_workers
openstack.image.api.workers
openstack.image.registry.workers
```

The default values for these attributes, particularly the compute and identity workers, is based on the number of CPUs and might need to be set to a smaller value. For more information about how to change these attributes, see “Customizing performance attributes” on page 127.

Network connectivity loss to nodes during deployment

You might experience a loss of network connectivity to your controller or compute nodes during the deployment process.

If you experience a loss of network connectivity to your controller node or compute nodes, update your environment file to skip the L3 agent and IP address movement recipes. By skipping these two recipes, the deployment is similar to the IBM Cloud Manager with OpenStack, version 4.1 deployment process.

Review the following information on disabling the IP address movement and L3 agent networking options.

IP address movement
IP address movement moves the data network interface and external network IP address to the related OVS bridge. With this feature, the IP address in the data network interface and external network interface can be accessed after the deployment process is finished. You can disable it by changing the **`ibm-openstack.network.ip_movement.enable`** parameter value from *true* to *false*.

L3 agent
You can disable the L3 agent by changing the **`ibm-openstack.network.l3.enable`** parameter value from *true* to *false*.

Note: If you leave the L3 agent enabled, then you must not disable the IP address movement recipe. Otherwise, the IP address in the external network interface is not accessible after the deployment process is complete.

Data bag item not found

You might see an error in the log that a data bag item is missing.

Symptoms

```
### Data bag item not found ###

    ================================================================================
    Recipe Compile Error in /var/chef/cache/cookbooks/openstack-identity/recipes/server.rb
    ================================================================================


    Net::HTTPServerException
    ------------------------
    404 "Object Not Found"


    Cookbook Trace:
    ---------------
      /var/chef/cache/cookbooks/openstack-common/libraries/passwords.rb:46:in `secret'
      /var/chef/cache/cookbooks/openstack-common/libraries/passwords.rb:52:in `get_secret'
      /var/chef/cache/cookbooks/openstack-identity/recipes/server.rb:113:in `from_file'


    Relevant File Content:
    ----------------------
    /var/chef/cache/cookbooks/openstack-common/libraries/passwords.rb:
```

Causes

The data bag attribute in your environment file might be incorrect or missing on the Chef server.

Resolving the problem

Verify that the data bag attributes in your environment file are correct and that the data bags and data bag items for your topology deployment exist on the Chef server. You can use the **`knife data bag list`** and **`knife data bag show my-data-bag-name`** commands to determine the data bags and data bag items available on the Chef server.

Deploying z/VM compute node fails

You attempt to deploy z/VM compute nodes but the deployment fails.

About this task

If you encounter problems when you deploy your z/VM compute nodes, verify that you updated all the required attributes in your environment file, `your-environment-name.json` prior to deployment. For example, verify that you add and update the following attribute:

- **`ibm-openstack.zvm-driver.xcat.mnadmin`**: Specify the xCAT management user that can **`ssh`** into `xcat mn`. If you do not set this user, the default value is *mnadmin*.

To view the necessary attributes, review all the steps in the "Deploying with z/VM compute nodes" on page 92 topic.

Deployment fails with package installation error

During deployment, a package might fail to install successfully and you receive a deployment error.

If you receive the following error during the deployment process, follow these steps to troubleshoot. The error message states:

```
================================================================
Error executing action `upgrade` on resource 'package[openstack-nova-common]'
=========================================================================
```

First, use one the following options to determine what caused the `` `package` `` to fail to install.

- **`SSH`** to the node where the `` `upgrade` `` failed, and attempt to **`'yum install'`** the `` `package` `` to see the detailed failure. For example, run `#` **`yum install openstack-nova-common`**. You receive a message similar to the one shown here.

  ```
  ...Error unpacking rpm package python-ecdsa-0.11-1.ibm.el6.noarch
  error: unpacking of archive failed on file /usr/lib/python2.6/site-packages/ecdsa-0.11-py2.6.egg-info: cpio: rename
  Verifying : python-ecdsa-0.11-1.ibm.el6.noarch 1/1

  Failed:
  python-ecdsa.noarch 0:0.11-1.ibm.el6

  Complete!
  ```

- Otherwise, **`SSH`** to the node where the `` `upgrade` `` failed, and view the `yum` log in `/var/log/yum.log` and identify the package that failed. For example:

  ```
  # cat /var/log/yum.log | grep ecdsa
  Sep 29 03:07:44 python-ecdsa-0.11-1.ibm.el6.noarch: 100
  ```

The installation of a package might fail if you use **`PIP`** to install python packages, prior to installing the RPMs. This combination is error prone.

Use the following steps to resolve the issue:

1. Uninstall the package that failed and deploy the topology again. For example:

   ```
   # pip uninstall ecdsa
   Uninstalling ecdsa:
     /usr/lib/python2.6/site-packages/ecdsa-0.11-py2.6.egg-info
     /usr/lib/python2.6/site-packages/ecdsa/__init__.py
     /usr/lib/python2.6/site-packages/ecdsa/__init__.pyc
     /usr/lib/python2.6/site-packages/ecdsa/_version.py
     /usr/lib/python2.6/site-packages/ecdsa/_version.pyc
     /usr/lib/python2.6/site-packages/ecdsa/curves.py
     /usr/lib/python2.6/site-packages/ecdsa/curves.pyc
     /usr/lib/python2.6/site-packages/ecdsa/der.py
     /usr/lib/python2.6/site-packages/ecdsa/der.pyc
     /usr/lib/python2.6/site-packages/ecdsa/ecdsa.py
   ```

```
  /usr/lib/python2.6/site-packages/ecdsa/ecdsa.pyc
  /usr/lib/python2.6/site-packages/ecdsa/ellipticcurve.py
  /usr/lib/python2.6/site-packages/ecdsa/ellipticcurve.pyc
  /usr/lib/python2.6/site-packages/ecdsa/keys.py
  /usr/lib/python2.6/site-packages/ecdsa/keys.pyc
  /usr/lib/python2.6/site-packages/ecdsa/numbertheory.py
  /usr/lib/python2.6/site-packages/ecdsa/numbertheory.pyc
  /usr/lib/python2.6/site-packages/ecdsa/rfc6979.py
  /usr/lib/python2.6/site-packages/ecdsa/rfc6979.pyc
  /usr/lib/python2.6/site-packages/ecdsa/six.py
  /usr/lib/python2.6/site-packages/ecdsa/six.pyc
  /usr/lib/python2.6/site-packages/ecdsa/test_pyecdsa.py
  /usr/lib/python2.6/site-packages/ecdsa/test_pyecdsa.pyc
  /usr/lib/python2.6/site-packages/ecdsa/util.py
  /usr/lib/python2.6/site-packages/ecdsa/util.pyc
Proceed (y/n)? y
  Successfully uninstalled ecdsa
```

2. Redeploy your topology.

Node verification failed

You might see an error in the log that the topology node verification failed.

Symptoms

```
ERROR: RuntimeError: Topology node verification failed.
```

Causes

An error in the topology file might cause this error.

Resolving the problem

Verify that the following information is correct in your topology file:

- Fully qualified domain name for each node
- Login information for each node

Correct any errors and try the task again.

Deploying a client node fails

You might see an error in the log that the topology node failed to deploy.

Symptoms

```
ERROR 14: Peer cert cannot be verified or peer cert invalid.
```

Causes

The deployment can fail if an SSL certificate exists on the client node.

Resolving the problem

Ensure that the client node does not have an existing SSL certificate.

1. On the Chef server, run the following commands:

   ```
   knife node delete -y  chef-client-fqdn
   knife client delete -y chef-client-fqdn
   ```

2. On the client node, run the following commands:
   a. Run the **rm -rf /etc/chef** command.
   b. Run the **rm -rf /etc/yum.repos.d/ibmos*** command.
   c. List the yum repos and validate that you do not have OpenStack yum repos configured:

1) Run **yum repolist** to list the repos.
2) Delete OpenStack yum repos. To delete all yum repos, run **yum clean all** or to delete an individual repo, run **yum erase <repo>**.

d. Delete the SSL certificates.

1) Export **NSS_DEFAULT_DB_TYPE="sql"**.
2) To list the named certificates in the NSS db, run the following command:

```
certutil -L -d /etc/pki/nssdb
```

3) To extract the Chef certificate and view who issued it, run the following command:

```
certutil -L -d /etc/pki/nssdb -a -n 'chef-server-cert' > chef.crt
openssl x509 -noout -text -in chef.crt | grep Issuer
```

4) To delete the Chef certificate, run the following command:

```
certutil -D -d /etc/pki/nssdb -n 'chef-server-cert'
```

Deploying a remote node fails

You attempt to deploy a remote compute node but the deployment fails.

About this task

When you try to deploy a remote compute node, you see the following error:

```
Deploy of node at fqdn_of_remote_compute_node failed:
Ssh execution of command 'bash -c '; exists() {; if command -v $1 ... }; EOP;
chef-client -j /etc/chef/first-boot.json -E Region1'' failed with exit status '1'.
Node 'FQDN_of_remote_compute_node' failed:
ERROR: Failed to add certificate for the Chef server..
See the log file '/var/log/chef-server/nodes/FQDN_of_remote_compute_node_2014-10-29_14-30-51-885630295000.log'
for more information.
```

where *FQDN_of_remote_compute_node* is the fully qualified domain name for the remote host.

This problem can occur when the Chef server cannot be reached by using its fully qualified domain name (FQDN). Try to ping the Chef server by using its FQDN. If you are unable to reach the Chef server, then you must change your DNS settings.

Related concepts:

"Adding a compute node to a deployed topology" on page 145
After deploying your topology, you can add a compute node system to your deployment. This does not apply to the Minimal topology.

Cookbook not found

You might see an error in the log file about missing cookbooks.

Symptoms

You might see an error similar to the following example:

```
================================================================================
Error Resolving Cookbooks for Run List:
================================================================================



Missing Cookbooks:
------------------
The following cookbooks are required by the client but don't exist on the server:
* openstack-common
```

Resolving the problem

Verify that the cookbook version constraints in the environment file are correct. The cookbook might exist on the Chef server, however, it might be ignored because of a version constraint. For example, a cookbook version constraint of ~> *9.2.0* would support versions >= *9.2.0* and < *9.3.0*. You can use **knife cookbook show cookbook-name** to determine the versions of a cookbook that are available.

Network interface not found

You might encounter an error in the log if the network interface cannot be found.

Symptoms

You might see information similar to the following example if a network interface is not defined correctly.

```
================================================================================
Recipe Compile Error in /var/chef/cache/cookbooks/openstack-common/recipes/set_endpoints_by_interface.rb
================================================================================


NoMethodError
-------------
undefined method `[]' for nil:NilClass


Cookbook Trace:
---------------
  /var/chef/cache/cookbooks/openstack-common/libraries/network.rb:29:in `address_for'
  /var/chef/cache/cookbooks/openstack-common/libraries/endpoints.rb:96:in `address'
```

Resolving the problem

Verify that the network interface attributes in the environment file and node specific attributes files are correct. For example, a node may not have an eth0 network interface which is the default value for some attributes.

Operating system repository not found

You might see an error in the log file that the yum repository is not available.

Symptoms

The error might be similar to the following example:

```
================================================================================
Error executing action `run` on resource 'ruby_block[operating system yum repository not available]'
================================================================================


#<Class:0x000000044e86b8&gt;::NoOperatingSystemRepositoryException
---------------------------------------------------------------
There are no yum repositories available that contain operating system packages that the openstack
installation depends on. You must either configure your nodes to have access to a yum repository
or you can create this repository on the deployment server. You can create your own repository by
copying the Packages and repodata directory from this node system's installation media to the
following location: https://mychefserver.com:14443/yum-repo/operatingsystem/rhel6.5/x86_64.
Once the yum repository is created on the server or you have updated the node systems yum repository
list to include a repository which contains operating system packages, re-run the deployment process.
The package used to test the repository is libvirt. For more information on creating your own
operating system yum repository, see the product documentation.
```

Resolving the problem

Follow the instructions that are outlined in the error to set up an operating system yum repository for your topology deployment.

Package failed to install or upgrade

You might see an error in the log file about being unable to upgrade a resource.

Symptoms

The error might be similar to the following example:

```
================================================================================
Error executing action `upgrade` on resource 'package[python-openstackclient]'
================================================================================
```

Resolving the problem

The node might be unable to connect to or use the Chef server or the operating system or IBM Cloud Manager with OpenStack package repositories. Log in to the node and attempt to install or upgrade the package manually. Start by clearing the expired package cache by running **yum clean expire-cache**, then attempt to install the failed package (for example, **yum install python-openstackclient**). If the package installs successfully, try the topology deployment or update again. If the package installation fails, the command output provides more information about why the error occurred and how to resolve it.

PowerVC driver deploys successfully; later is dead

It appears that you successfully deployed a controller node that includes the PowerVC driver, but later the PowerVC driver service is dead.

Symptoms

After successfully deploying a controller node you might subsequently notice that PowerVC services are dead and the system is unusable.

Causes

A configuration error such as a mistake for the IP address of the PowerVC host system can cause the PowerVC driver services to eventually fail.

Diagnosing the problem

You can use the following command to check the status of the PowerVC driver service.

```
service openstack-nova-powervc status
```

Resolving the problem

If PowerVC services are dead, ensure that the settings in the environment file are correct. Then try the deployment task again.

Compute node is deployed or updated successfully; later Open vSwitch agent is down

You successfully deploy, update, or apply a fix pack to a compute node, but later the Open vSwitch agent on the compute node is down.

Symptoms

After you successfully deploy, update, or apply a fix pack to a compute node, you are unable to start a new virtual machine.

You check the status of the Open vSwitch agent by running the following command on your controller node:

```
neutron agent-list
```

The Open vSwitch agent is down.

Causes

This problem can occur for various reasons, one of which is that there is an error in the /etc/neutron/plugins/openvswitch/ovs_neutron_plugin.ini file on the compute node.

Resolving the problem

To resolve the problem, try to restart the Open vSwitch agent by running the following command on the compute node:

```
service neutron-openvswitch-agent restart
```

Take one of the following actions:

- If the agent status on the controller is active, try to start the virtual machine.
- If the agent status is not active, see the /var/log/neutron/openvswitch-agent.log file on the compute node.

If you applied a fix pack to multiple PowerKVM compute nodes, it is likely that the agent is down on all of them. You can resolve the problem similarly for each compute node.

Fingerprint error during deploy

When redeploying to a node where a topology has previously been deployed, you receive an SSH fingerprint error.

Symptoms

When updating the environment during the deployment process, you receive an error similar to the following:

```
ERROR: fingerprint 1d:51:e2:2d:79:85:9c:c0:7c:9d:82:c7:3f:94:ad:b4 does not
match for "your_system.domain.com,x.x.x.x"
ERROR: /opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh
/verifiers/secure.rb:50:in `process_cache_miss'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
verifiers/secure.rb:35:in `verify'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
verifiers/strict.rb:16:in `verify'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
verifiers/lenient.rb:15:in `verify'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh
/transport/kex/diffie_hellman_group1_sha1.rb:173:in `verify_server_key'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/kex/diffie_hellman_group1_sha1.rb:68:in `exchange_keys'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/algorithms.rb:364:in `exchange_keys'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/algorithms.rb:205:in `proceed!'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/algorithms.rb:196:in `send_kexinit'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/algorithms.rb:151:in `accept_kexinit'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:195:in `block in poll_message'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:173:in `loop'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:173:in `poll_message'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:210:in `block in wait'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:208:in `loop'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:208:in `wait'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/ssh/
transport/session.rb:87:in `initialize'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/
ssh.rb:202:in `new'
```

```
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-2.9.0/lib/net/
ssh.rb:202:in `start'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-multi-1.2.0/lib/net/
ssh/multi/server.rb:185:in `new_session'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/chef-11.12.4/lib/chef/
monkey_patches/net-ssh-multi.rb:79:in `next_session'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-multi-1.2.0/lib/
net/ssh/multi/server.rb:138:in `session'
/opt/chef/embedded/lib/ruby/gems/1.9.1/gems/net-ssh-multi-1.2.0/lib/
net/ssh/multi/session_actions.rb:36:in `block (2 levels) in sessions'
ERROR: Node 'powervc-rhel64' at your_system.domain.com verification error:
Could not connect to your_system.domain.com
as user 'root' with the specified password : Ssh execution of command
'2>/dev/null 1>&2 echo hello' failed:
fingerprint 1d:51:e2:2d:79:85:9c:c0:7c:9d:82:c7:3f:94:ad:b4 does not match
for "your_system.domain.com,x.x.x.x"
ERROR: RuntimeError: Topology node verification failed.
```

Resolving the problem

You might need to delete the SSH fingerprint on your deployment server. The deployment knife commands use SSH to communicate with the node system to deploy OpenStack. Use one of the following methods to delete SSH fingerprints from the `.ssh/known_hosts` file on the deployment server:

- Run the following command:

  ```
  ssh-keygen -R node fqdn
  ```

- Edit the `.ssh/known_hosts` file in a text editor and delete the line that contains your node system.

Error restarting neutron when deploying a topology

When you attempt to deploy a topology, you receive an error about restarting the neutron-plugin-openvswitch-agent service.

Symptoms

You see something similar to the following error:

```
ESC[31mError executing action `restart` on resource 'service[neutron-plugin-openvswitch-agent]'ESC
```

Causes

You might not have the right version of a package, such as OpenSSL.

Resolving the problem

Ensure that the yum repositories are configured correctly so that package updates are accessible. For more information, see “Configuring operating system yum repositories on the deployment server” on page 37.

Then, try the deployment task again.

Cinder error occurs when you deploy a controller node

You see a cinder error in the log after you try to deploy a controller node.

Symptoms

You try to deploy a controller node and it fails. You check the log and see the following error message:

```
Error executing action `run` on resource 'execute[cinder-manage db sync]'
IOError: [Errno 13] Permission denied: '/var/log/cinder/cinder.log'
```

Causes

This error can occur if Service Pack 1 is not installed before you deploy a controller node with storage support.

Resolving the problem

To resolve the problem, manually delete the /var/log/cinder/cinder.log file and reconverge the controller node.

Internal service error occurs when you run a knife command

You receive an internal service error when you run a knife command.

The error might be similar to the following example:

```
knife environment from file environment.json
ERROR: internal server error
Response: internal service error
```

To resolve the problem, run the **chef-server-ctl tail** command and read the information in the chef-server logs. You can also review the logs in the /var/log/chef-server directory to find more information about the cause of the error and how to resolve it.

Error upgrading the openstack-selinux package

When you deploy a topology with IBM Cloud Manager with OpenStack, you receive an error about upgrading the openstack-selinux package.

Symptoms

The specific error might look similar to the following message:

```
Error executing action `upgrade` on resource 'package[openstack-selinux]'
```

Resolving the problem

1. To resolve the error, downgrade **libselinux** and **libselinux-utils** by using the following command:

   ```
   # yum downgrade libselinux libselinux-utils
   ```

   The system should display output similar to the following output:

   ```
   Loaded plugins: product-id, rhnplugin, subscription-manager
   Setting up Downgrade Process
   Resolving Dependencies
   --> Running transaction check
   ---> Package libselinux.ppc64 0:2.0.94-5.3.el6 will be a downgrade
   ---> Package libselinux.ppc64 0:2.0.94-5.3.el6_4.1 will be erased
   ---> Package libselinux-utils.ppc64 0:2.0.94-5.3.el6 will be a downgrade
   ---> Package libselinux-utils.ppc64 0:2.0.94-5.3.el6_4.1 will be erased
   --> Finished Dependency Resolution

   Dependencies Resolved

   ================================================================================
   Package Arch Version Repository Size
   ================================================================================
   Downgrading:
   libselinux ppc64 2.0.94-5.3.el6 local-rhels6.4-ppc64 112 k
   libselinux-utils ppc64 2.0.94-5.3.el6 local-rhels6.4-ppc64 81 k

   Transaction Summary
   ================================================================================
   Downgrade 2 Package(s)
   ```

2. Retry the topology deployment.

No IP addresses on virtual machines after deployment

There is a known issue that Open vSwitch VLANs do not work with older NICs.

You must use a NIC whose driver does not have VLAN problems.

For more information about an Open vSwitch workaround, see ovs–vlan–bug–workaround. There is additional information on the following Open vSwitch Frequently Asked Questions page as well.

Self-service portal displays volumes attached to wrong device

For a PowerVM environment, when you investigate volumes that are attached to a device, the name that is displayed by the self-service portal user interface is not meaningful.

The **Attached VM** or **Attached to** fields in the user interface display a device name (or mount point). For example, `Attached to icm42ui on /dev/sdb`. For PowerVM, this device name is meaningless and does not reflect the actual device name in the guest operating system.

The following example shows the device details that display from the **`Cinder show`** command, which are also meaningless for PowerVM.

```
------------------------------------------------------------------------+
|              attachments              |      [{u'device': u'/dev/sdd', u'server_id':
u'bddd1457-507f-42a5-9d56-a2a6c79f1e6c', u'id': u'c21a8b02-7454-4018-9539-9c1fa4b60a71',
u'host_name': None, u'volume_id': u'c21a8b02-7454-4018-9539-9c1fa4b60a71'}]
```

Note: This behavior applies only to PowerVM environments.

Known problems and solutions for an Administrator

If you are using IBM Cloud Manager with OpenStack with the *Administrator* role, review theses known problems and solutions that you might encounter.

If your particular problem is not represented, see "Searching knowledge bases" on page 296 for a list of other references, particularly the Techdocs Web site, where more recent solutions or workarounds might instead reside.

Known issues

There are several known issues with the current release of IBM Cloud Manager with OpenStack.

If your particular problem is not represented, see "Searching knowledge bases" on page 296 for a list of other references, particularly the Techdocs Web site, where more recent solutions or workarounds might instead reside.

DBDuplicateEntry error in Neutron server log

After you finish the deploying, if you use DB2 as the OpenStack database, you might see the `DBDuplicateEntry` error in the Neutron server log. This error message does not impact any OpenStack function. The error appears in the error log of the Neutron server and openvswitch-agent.

Symptoms

In the `/var/log/neutron/server.log` and `/var/log/neutron/openvswitch-agent.log`, you might see the following errors, which are a result of the `DBDuplicateEntry` error:

Note: The output has been formatted for display purposes.

```
2014-11-10 23:14:36.050 31989 ERROR oslo.messaging.rpc.dispatcher [req-e07a7ed7-d22f-40e9-b299-aba6e06f
9470 ]
Exception during message handling: (IntegrityError) ibm_db_dbi::IntegrityError: Statement Execute Failed:
[IBM][CLI Driver][DB2/LINUXX8664] SQL0803N  One or more values in the INSERT statement, UPDATE statement,
or foreign key update caused by a DELETE statement are not valid because the primary key, unique constraint
or unique index identified by "2" constrains table "NEUTRON.AGENTS" from having duplicate values for
the index key.
SQLSTATE=23505 SQLCODE=-803 'INSERT INTO agents (id, agent_type, "binary", topic, host, admin_state_up,
created_at,
started_at, heartbeat_timestamp, description, configurations) VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?)'
```

```
('5028b520-1a90-46c2-9e97-b1cb80d6ebe0', 'Open vSwitch agent', 'neutron-openvswitch-agent', 'N/A',
'testhl12.sce.ibm.com', '1', datetime.datetime(2014, 11, 11, 4, 14, 35, 580590),
datetime.datetime(2014, 11, 11, 4, 14, 35, 580590), datetime.datetime(2014, 11, 11, 4, 14, 35, 580590),
None, '{"arp_responder_enabled": false, "tunneling_ip": "10.11.1.12", "devices": 0, "l2_population":
false,
 "tunnel_types": ["gre", "vxlan"], "enable_distributed_routing": false, "bridge_mappings": {"default":
"br-eth1"}}')
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher Traceback (most recent call last):
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/messaging/rpc/dispatcher.py", line 134, in _dispatch_and_reply
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher incoming.message))
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/messaging/rpc/dispatcher.py", line 177, in _dispatch
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher return self._do_dispatch(endpoint,
method, ctxt, args)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/messaging/rpc/dispatcher.py", line 123, in _do_dispatch
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
result = getattr(endpoint, method)(ctxt, **new_args)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/neutron/db/agents_db.py", line 237, in report_state
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self.plugin.create_or_update_agent(context, agent_state)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/neutron/db/agents_db.py", line 214, in create_or_update_agent
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
return self._create_or_update_agent(context, agent)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/neutron/openstack/common/excutils.py", line 82, in __exit__
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
six.reraise(self.type_, self.value, self.tb)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/neutron/db/agents_db.py", line 197, in create_or_update_agent
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
return self._create_or_update_agent(context, agent)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/neutron/db/agents_db.py", line 191, in _create_or_update_agent
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
greenthread.sleep(0)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 447, in __exit__
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self.rollback()
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/util/langhelpers.py", line 58, in __exit__
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
compat.reraise(exc_type, exc_value, exc_tb)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 444, in __exit__
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self.commit()
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py",
line 354, in commit
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self._prepare_impl()
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 334, in _prepare_impl
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self.session.flush()
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 1818, in flush
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
self._flush(objects)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 1936, in _flush
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
```

```
transaction.rollback(_capture_exception=True)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/util/langhelpers.py", line 58, in __exit__
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
compat.reraise(exc_type, exc_value, exc_tb)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/session.py", line 1900, in _flush
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
flush_context.execute()
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/unitofwork.py", line 372, in execute
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
rec.execute(self)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/unitofwork.py", line 525, in execute
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
uow
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/persistence.py", line 64, in save_obj
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
table, insert)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/orm/persistence.py", line 569, in _emit_insert_
statements
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
execute(statement, params)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/engine/base.py", line 662, in execute
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
params)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/engine/base.py", line 761, in _execute_clauseelement
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
compiled_sql, distilled_params
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib64/python2.6/site-packages/sqlalchemy/engine/base.py", line 874, in _execute_context
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
context)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/db/sqlalchemy/compat/handle_error.py", line 125, in _handle_
dbapi_exception
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
six.reraise(type(newraise), newraise, sys.exc_info()[2])
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/db/sqlalchemy/compat/handle_error.py", line 102, in _handle_
dbapi_exception
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
per_fn = fn(ctx)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/db/sqlalchemy/exc_filters.py", line 323, in handler
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
context.is_disconnect)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
File "/usr/lib/python2.6/site-packages/oslo/db/sqlalchemy/exc_filters.py", line 223, in _db2_dupe_key_
error
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher     raise exception.DBDuplicateEntry(
[], integrity_error)
2014-11-10 23:14:36.050 31989 TRACE oslo.messaging.rpc.dispatcher
DBDuplicateEntry: (IntegrityError) ibm_db_dbi::IntegrityError:
Statement Execute Failed: [IBM][CLI Driver][DB2/LINUXX8664] SQL0803N
One or more values in the INSERT statement, UPDATE statement, or
foreign key update caused by a DELETE statement are not valid because
the primary key, unique constraint or unique index identified by "2"
constrains table "NEUTRON.AGENTS" from having duplicate values for the index key.
SQLSTATE=23505 SQLCODE=-803 'INSERT INTO agents (id, agent_type, "binary",
topic, host, admin_state_up, created_at, started_at, heartbeat_timestamp,
description, configurations) VALUES (?, ?, ?, ?, ?, ?, ?, ?, ?, ?, ?)'
```

```
('5028b520-1a90-46c2-9e97-b1cb80d6ebe0', 'Open vSwitch agent',
'neutron-openvswitch-agent', 'N/A', 'testhl12.sce.ibm.com', '1',
datetime.datetime(2014, 11, 11, 4, 14, 35, 580590), datetime.datetime(2014, 11, 11, 4, 14, 35,
580590),
datetime.datetime(2014, 11, 11, 4, 14, 35, 580590), None, '{"arp_responder_enabled": false,
"tunneling_ip": "10.11.1.12", "devices": 0, "l2_population": false, "tunnel_types": ["gre",
"vxlan"],
"enable_distributed_routing": false, "bridge_mappings": {"default": "br-eth1"}}')
```

Resolution

This error does not impact any function. You can ignore these errors.

Self-service portal displays unknown or missing instances

You might encounter a situation where the instance status is *unknown* or missing from the self-service portal.

Symptom

This occurs whenever the instance is not removed using the self-service portal interface or self-service portal REST API. For example, if you use the OpenStack command line or the PowerVC interface to remove the instance, the status displays as *unknown* or is missing in the self-service portal.

Resolution

To resolve this issue, you must manually remove the instance using the self-service portal interface, assuming the instance does not exist in OpenStack.

If the instance status is missing, consider these circumstances for PowerVC:

- The instance has an outstanding **task_state**, except the "Activating" **task_state**.
- The instance is in ERROR state, and it has no **"host**" or "**hypervisor_hostname**" property defined.

If an instance is in either of these states, then the instance does not populate the self-service portal in IBM Cloud Manager with OpenStack.

Unexpected error in neutron-ns-metadata-proxy-*.log

You might see many unexpected errors in the neutron-ns-metadata-proxy-*.log when you boot an instance that has an l3-agent that is enabled in the environment.

These errors appear even though you already created the external network, router, and set router gateway.

Symptoms

In the /var/log/neutron/neutron-ns-metadata-proxy-*.log file, you see the following errors (altered for formatting purposes):

```
ERROR neutron.agent.metadata.namespace_proxy [-] Unexpected error.
TRACE neutron.agent.metadata.namespace_proxy Traceback (most recent call last):
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-
packages/neutron/agent/metadata/namespace_proxy.py", line 72, in __call__
TRACE neutron.agent.metadata.namespace_proxy     req.body)
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/
neutron/agent/metadata/namespace_proxy.py", line 103, in _proxy_request
TRACE neutron.agent.metadata.namespace_proxy     connection_type=UnixDomainHTTPConnection)
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/httplib2/
__init__.py", line 1605, in request
TRACE neutron.agent.metadata.namespace_proxy     (response, content) = self._request(conn,
authority, uri, request_uri, method, body, headers, redirections, cachekey)
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/httplib2/
```

```
__init__.py", line 1353, in _request
TRACE neutron.agent.metadata.namespace_proxy     (response, content) = self._conn_request(conn,
request_uri, method, body, headers)
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/httplib2/
__init__.py", line 1327, in _conn_request
TRACE neutron.agent.metadata.namespace_proxy     conn.connect()
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/neutron/
agent/metadata/namespace_proxy.py", line 46, in connect
TRACE neutron.agent.metadata.namespace_proxy     self.sock.connect(cfg.CONF.metadata_proxy_socket)
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/eventlet/
greenio.py", line 222, in connect
TRACE neutron.agent.metadata.namespace_proxy     while not socket_connect(fd, address):
TRACE neutron.agent.metadata.namespace_proxy   File "/usr/lib/python2.6/site-packages/eventlet/
greenio.py", line 36, in socket_connect
TRACE neutron.agent.metadata.namespace_proxy     raise socket.error(err, errno.errorcode[err])
TRACE neutron.agent.metadata.namespace_proxy error: [Errno 2] ENOENT
TRACE neutron.agent.metadata.namespace_proxy
```

Resolution

This issue exists because the metadata service is not enabled. The preceding errors do not impact any functions. You can ignore them.

Upgrading a topology fails

You might see an error in the log after upgrading a topology.

Symptoms

You try to in-place upgrade a topology and it fails. You check the log and see the following error message:

```
========================================================================
Error executing action `run` on resource 'execute[heat-keystone-setup-domain]'
================================================================================

Mixlib::ShellOut::ShellCommandFailed
------------------------------------
Expected process to exit with [0], but received '1'
---- Begin output of heat-keystone-setup-domain ----
STDOUT:
STDERR: ERROR (heat-keystone-setup-domain:115) User 'admin' is not authorized to
perform this operation, please try with other OS_USERNAME setting.
---- End output of heat-keystone-setup-domain ----
```

Causes

The issue is caused by policy difference between IBM Cloud Manager with OpenStack version 4.1 and 4.2.

Resolution

You need to modify the keystone policy file and restart keystone service on each node in your topology.

1. Modify the /etc/keystone/policy.json file. Change the line `"global_admin": "(rule:admin_role and domain_id:default) or is_admin:1"` to `"global_admin": "rule:admin_role or is_admin:1"`.
2. Run the following command to restart keystone service:

   ```
   service openstack-keystone restart
   ```

Error when removing floating IP address

An error appears in the `l3-agent.log` when you attempt to remove a floating IP address.

This error may occur if you have not manually installed the conntrack-tools in the *l3-agent* system. The error does not break any Neutron functions.

Symptoms

While you attempt to delete a floating IP address with OpenStack, the floating IP address is deleted successfully, but there is the following error in the l3-agent.log.

```
Executable not found: conntrack
```

This error occurs because the conntrack-tools is not installed by IBM Cloud Manager with OpenStack, but Neutron calls the **conntrack** command.

Resolution

To resolve this issue, install the conntrack-tools manually. For more information, see the "conntrack-tools" project.

Restarting network deletes some OVS ports

The IP movement function is enabled in your environment by default. If it is enabled after the deployment process is complete, after the network restarts, some ports in the external network bridge and data network bridge disappear.

Symptoms

Symptom 1

Assumes that IP movement is enabled in your environment and you do not have the router gateway set in your external network.

1. Run **ovs-vsctl show** to view the *phy-br-eth1* in br-eth1.

```
Bridge "br-eth1"
        Port "br-eth1"
            Interface "br-eth1"
                type: internal
        Port "eth1"
            Interface "eth1"
        Port "phy-br-eth1"
            Interface "phy-br-eth1"
                type: patch
                options: {peer="int-br-eth1"}
```

2. Run **service network restart** to restart the network.
3. Run **ovs-vsctl show** to see that the *phy-br-eth1* port disappeared.

```
Bridge "br-eth1"
        Port "br-eth1"
            Interface "br-eth1"
                type: internal
        Port "eth1"
            Interface "eth1"
```

Symptom 2

Assumes the following conditions:

- IP movement is enabled in your environment.
- You created an external network and ran **neutron router-gateway-set router-name external-network-name** to set the gateway for your external network.

To view the symptom, complete the following steps:

1. Run **ovs-vsctl show** to view the following ports in *br-eth1* and *br-ex*.

```
Bridge br-ex
        Port "qg-5bf61667-67"
            Interface "qg-5bf61667-67"
```

```
                type: internal
        Port br-ex
            Interface br-ex
                type: internal
        Port "eth2"
            Interface "eth2"
.........
    Bridge "br-eth1"
        Port "br-eth1"
            Interface "br-eth1"
                type: internal
        Port "eth1"
            Interface "eth1"
        Port "phy-br-eth1"
            Interface "phy-br-eth1"
                type: patch
                options: {peer="int-br-eth1"}
```

2. Run **service network restart** to restart the network. Notice that *qg-5bf61667-67* and *phy-br-eth1* ports in br-ex and br-eth1 disappear.

```
Bridge br-ex
        Port br-ex
            Interface br-ex
                type: internal
        Port "eth2"
            Interface "eth2"

    Bridge "br-eth1"
        Port "br-eth1"
            Interface "br-eth1"
                type: internal
        Port "eth1"
            Interface "eth1"
```

Resolution

Resolution for Symptom 1

Run service **neutron-openvswitch-agent** restart to resolve the issue.

Resolution for Symptom 2

1. Run **service neutron-openvswitch-agent restart** to restart openvswitch-agent.
2. Run **service neturon-l3-agent restart** to restart l3-agent.
3. Run **neutron router-gateway-set router_name external_network_name** to reset the router gateway.
4. Run **ovs-vsctl show** to verify that the missing ports reappear.

SSH permissions error when resizing an instance (OpenStack)

If you are resizing an instance on multiple PowerKVM hypervisors, you might encounter an ssh ...Permission denied error.

In this situation, you must ensure that the hypervisors can **ssh** (as a Nova user) to each other by public key. To do so, complete the following steps:

1. Obtain a key pair (public key and private key). You can use the root key that is in the `/root/.ssh/id_rsa and /root/.ssh/id_ras.pub directories or you can generate a new key pair.
2. Run **setenforce 0** to put SELinux into permissive mode.
3. Enable login abilities for the Nova user.

   ```
   usermod -s /bin/bash nova
   ```

   Now you can switch to the Nova account by using the following command.

   ```
   su nova
   ```

4. Create the folder that is needed by **ssh** and place the private key that you obtained in step 1 into this folder.

   ```
   mkdir -p /var/lib/nova/.ssh
   cp <private key>  /var/lib/nova/.ssh/id_rsa
   cat<pub key> >> /var/lib/nova/.ssh/authorized_keys
   echo 'StrictHostKeyChecking no' >> /var/lib/nova/.ssh/config
   chmod 600 /var/lib/nova/.ssh/id_rsa /var/lib/nova/.ssh/authorized_keys
   ```

5. Repeat steps 2-4 on each node.

   Important: All the nodes share a key pair and you must not generate a new key pair for the second node.

6. Ensure that the key is working properly.

   ```
   # su - nova
   # ssh node-another
   ```

   Note:

   a. You log in to the *node-another* node without a password.
   b. If your server is configured with both the IP address and the hostname, you must run this command twice. For example:
      1) **su nova ssh nova@host-name**
      2) **su nova ssh nova@x.x.x.x**

         where *x.x.x.x* is the server IP address.

Ceilometer collector not working after message queue is restarted

You might experience problems if you restart the message queue service on its own.

Symptom

The Ceilometer collector is not working and the message queue service was restarted recently.

Explanation

If the message queue is restarted, it is possible that the Ceilometer collector cannot collect metrics.

Resolution

Restart the Ceilometer collector service.

1. Log in to the controller node.
2. Run the following command:

   ```
   service openstack-ceilometer-collector restart
   ```

PowerVC quota exceeded

When you deploy an instance on PowerVC, you might see an error that the instance quota was exceeded.

Symptoms

You receive the following error when you deploy an instance on PowerVC.

```
NV-02B1F9F Quota exceeded for instances
```

Resolving the problem

Check the user's tenant and run the following command **nova quota-update --instances <number> <tenant of the user>**

where **<number>** is a larger number than the current value and **<tenant of the user>** is the tenant or project ID to which the user belongs.

Installation fails after uninstall

When you attempt to install IBM Cloud Manager with OpenStack on the deployment server, after performing an uninstall, the installation fails with a NONFATAL_ERROR during console and graphical user interface mode installs or with a nonzero return code during silent mode installs.

Symptoms

The installation fails with a NONFATAL_ERROR during console and graphical user interface mode installs or with a nonzero return code during silent mode installs after performing an uninstall.

Causes

Occasionally, the IBM Cloud Manager with OpenStack uninstall process does not remove the openstack-utils RPM. This symptom appears when the installation process attempts to install this package again. To verify this is the case, review the /tmp/cmwo-installer.log to determine whether the openstack-utils was already installed. If a line similar to the following is found in the /tmp/cmwo-installer.log then this is the cause of the symptom:

```
package openstack-utils-2014.1.1-201405072052.ibm.el6.15.noarch is already installed
```

If the symptom was caused for other reasons, contact your support representative.

Resolving the problem

To resolve the problem, complete the following steps.

- Uninstall IBM Cloud Manager with OpenStack by running, **cmwo_uninstall**.
- Uninstall the openstack-utils RPM by running, **yum erase openstack-utils -y**.
- Install IBM Cloud Manager with OpenStack.

Cannot resize z/VM instance (self-service portal)

You cannot resize a z/VM instance through IBM Cloud Manager with OpenStack.

Symptoms

While you attempt to resize a z/VM instance through IBM Cloud Manager with OpenStack, it might take a long time and appear to fail.

Causes

The virtual machine status in the OpenStack command line displays the following message:

```
VERIFY_RESIZE
```

However, you can access the virtual machine, and the virtual machine resize is successful. The resize operation can take a long time (for example, 2 hours or more), depending on the size of the virtual machine. IBM Cloud Manager with OpenStack times out while waiting for the resize operation to finish.

Resolving the problem

You can extend the timeout value for this operation in the openstack.properties file. Modify the **com.ibm.cfs.cloud.openstack.client.wait.for.server.resize.timeout.in.seconds** value.

Cannot resize PowerVC instance

You cannot resize a PowerVC instance through IBM Cloud Manager with OpenStack.

Symptoms

While you attempt to resize a PowerVC instance through IBM Cloud Manager with OpenStack, you might receive an error similar to the following message.

```
Exception during message handling:
Get error: PVCExpendvdiskFCMapException:
Flashcopy is in progress for boot volume, volume size didn't change.
Please try again later. (HTTP 409) (Request-ID: req-xxxx)
```

Resolving the problem

After you create the virtual machine in PowerVC from IBM Cloud Manager with OpenStack, the create process completes, but the FlashCopy might not complete in the backend of PowerVC. You cannot complete the resize operation during this time. You must wait to resize the instance until the FlashCopy completes as well.

Cannot complete active resize of PowerVC instance

You cannot complete an active resize of a PowerVC instance through IBM Cloud Manager with OpenStack.

Symptoms

While you attempt to actively resize a PowerVC instance through IBM Cloud Manager with OpenStack, you might receive an error.

Resolving the problem

If the virtual machine (running PowerVC from IBM Cloud Manager with OpenStack), does not meet the requirements for an active restart, you must stop the virtual machine before you resize the instance. For more information, see “Resizing an instance (OpenStack)” on page 247.

Instance status on PowerVC driver hangs and the migration fails

Instance `migrating` status hangs on PowerVC driver and the migration fails.

Symptoms

When you are using IBM Cloud Manager with OpenStack with the PowerVC driver to migrate an instance on PowerVC, you might encounter a problem where live migration fails. The instance status might hang and stay in `migrating` status for a long time. When this occurs, you cannot use the instance.

Resolving the problem

To resolve this problem, use **`ssh`** to access the IBM Cloud Manager with OpenStack controller node and check the log file `nova-powervc.log` in the directory `/var/log/powervc`. Fix the problem that is described in the log file. After the problem is fixed, use the command **`nova reset-state`** to reset the instance status. After the status of the instance is changed to `active` by the PowerVC driver code, rerun the live migration operation.

Cannot attach disk to virtual machine without restarting the virtual machine

After you attach a disk to a virtual machine that is running PowerKVM, the new volume is not visible on the associated instance unless you restart the virtual machine.

Symptoms

You attached a disk to a PowerKVM virtual machine by using IBM Cloud Manager with OpenStack, but when you check the instance, the volume does not display. If you restart the virtual machine, the attached disk does display.

Causes

The packages that support hotplug on PowerKVM are out of date.

Resolving the problem

The packages on the guest that you are using for the virtual machine must be updated. To support hotplug, you must update the following packages to the latest versions:

- `powerpc-util`

- `librtas`
- `ppc64-diag`

To download the latest versions of the PowerKVM packages for your Linux distribution, see Index of /software/server/POWER/Linux/yum/IBM.

Two users within the same browser

Logging in as two different users within the same browser shows only the most recent user.

Details

Different tabs or windows of the same browser instance share the same session and browser cookies so the user does not really have two independent sessions. If a user logs in with two different user IDs at the same time, the browser will use information based on that most recent login, and there is no clear indication that one just superseded the other. For example, if a user logs in as UserA in one browser window and UserB in another browser window, both windows are UserB, and all content and settings displayed belong to UserB.

Solution

To log in as a different user with a browser, log out and close all browser instances before logging in as the alternate user. To log in as two different users at the same time, two different browsers are needed, for example, Internet Explorer and Mozilla Firefox.

Delete of an instance while a storage flashcopy is running against the instance will cause the delete to fail

An IBM Cloud Manager with OpenStack instance cannot be deleted immediately after the same instance has been deployed or captured.

Details

A recently deployed or captured IBM Cloud Manager with OpenStack instance has a status of "OK" and the cloud manager instance status also shows "OK", but the storage flashcopy may still be in progress, and an attempt to delete the instance while the flashcopy is running will cause the delete to fail.

Solution

To prevent an error from happening on a delete soon after a deploy or capture, you must either monitor the flashcopy until it ends, or wait for some conservative period of time, for example, 20 minutes, before attempting the delete.

The best way to tell if the flashcopy has finished is by accessing the storage subsystem user interface (UI). Here is how to use the Storwize storage subsystem UI to determine when the flashcopy is finished:

1. Access Storwize UI.
2. From IBM Cloud Manager with OpenStack, perform the deploy or capture.
3. From the Storwize UI left navigation pane, select: Copy Services, then Flashcopy Mappings.

   A flash copy should be in progress. If a flash copy is not in progress, wait for it to be displayed; in our testing the flashcopy usually appeared about 30-60 seconds after the IBM Cloud Manager with OpenStack deploy or capture was started.
4. Wait until the flash copy completes. Once the flash copy has completed, the IBM Cloud Manager with OpenStack instance can be deleted.

PKI error when adding OpenStack cloud with self-service portal

You encounter an error message when you attempt to add an OpenStack cloud to IBM Cloud Manager with OpenStack using the self-service portal.

Details

You receive the following message when you are attempting to add an OpenStack cloud to IBM Cloud Manager with OpenStack. `Error: Unreachable Cloud :CYX6154E: An error occurred while making the OpenStack identity service token request for user 'sceagent'. The identity service responded with the following status: 500 - Error occurred when dealing with PKI token. The internal reason is '__init__() got an unexpected keyword argument 'output'' Verify that the identity service is running, and that the user name, password and tenant name are correct. Contact your system administrator for assistance.`

Solution

Due to time change on the deployment server, or because a Network Time Protocol (NTP) server is not being used, the self-signed certificates that are used for PKI tokens can become invalid. To fix the issue, ensure that the deployment server operating system has the correct date and time. Then, use the following steps to regenerate the tokens:

1. Stop the OpenStack keystone service. For more information, see "Restarting IBM Cloud Manager with OpenStack services" on page 208.

   Note: Stop only the keystone service.
2. Clear the keystone certificates by using the following command:

   ```
   # rm -rf keystone base signing directory
   ```

   Where *keystone base signing directory* is found in the `/etc/keystone/keystone.conf` file of the controller, under the [signing] section. By default, the base signing directory is `/etc/keystone/ssl`.
3. Generate new PKI keys. Alternatively, you can import external certificates.
   a. Find the **keystone user** and **keystone group** by running the following command on the OpenStack controller:

      ```
      ls -la /etc/keystone/ssl
      ```

      The **keystone user** is the owner of that directory. The **keystone group** is the group that is identified for that directory.
   b. Use the following command to generate new PKI keys:

      ```
      # keystone-manage pki_setup --keystone-user keystone user --keystone-group keystone group
      ```
4. Verify the new ticket by using the following command.

   ```
   # openssl x509 -in  /etc/keystone/ssl/certs/signing_cert.pem -text -noout
   ```

   The output lists the current date and time in the output for the **Not Before** value.
5. Clear the PKI signing caches on the OpenStack controller by using the following commands:

   ```
   rm /var/cache/ceilometer/api/*
   rm /var/cache/cinder/api/*
   rm /var/cache/glance/api/*
   rm /var/cache/glance/registry/*
   rm /var/cache/nova/api/*
   rm /var/lib/neutron/keystone-signing/*
   ```

   Note: If the `signing_dir` directory is not present, temporary caches are used. If temporary caches are used, restarting the service creates a new cache.
6. Restart OpenStack services and the self-service portal. For more information, see "Restarting IBM Cloud Manager with OpenStack services" on page 208.

Error opening sockets to server when using DB2

When you are running IBM Cloud Manager with OpenStack with DB2 as the database, you intermittently encounter an unexpected condition that the server cannot fulfill the request.

Details

The following specific error is displayed:

```
The server encountered an unexpected condition which prevented it from fulfilling the request
```

If you check the IBM Cloud Manager with OpenStack log you might see an exception similar to the following:

```
[05/16/13 04:38:17:009] 33904 SEVERE: CYX1846E: Internal database error.
<openjpa-2.1.0-r422266:1071316 fatal general error> org.apache.openjpa.persistence.
PersistenceException: [jcc][t4][2043][11550][4.8.87] Exception java.net.NoRouteToHostException:
Error opening socket to server localhost/127.0.0.1 on port 50,000 with message: Cannot assign
requested address. ERRORCODE=-4499, SQLSTATE=08001. Stack Trace: <openjpa-2.1.0-r422266:1071316
fatal general error> org.apache.openjpa.persistence.PersistenceException:
[jcc][t4][2043][11550][4.8.87] Exception java.net.NoRouteToHostException: Error opening socket to
server localhost/127.0.0.1 on port 50,000 with message: Cannot assign requested address.
ERRORCODE=-4499, SQLSTATE=08001
```

DB2 socket connections in TIMED_WAIT state are exhausting the available ports for DB2 connections. Normally, the system releases sockets in TIMED_WAIT state after 2 minutes. However, in some cases, this wait is too long and there are no more available sockets to use. You can reduce the amount of wait time by adjusting the TIMED_WAIT reuse and recycle values on the IBM Cloud Manager with OpenStack server.

Solution

To adjust the TIMED_WAIT reuse and recycle values on the controller node for the deployed topology, add the following to the `/etc/sysctl.conf` file:

```
net.ipv4.tcp_tw_reuse = 1
net.ipv4.tcp_tw_recycle = 1
```

Make the TIMED_WAIT reuse and recycle values effective by using the following command:

```
/sbin/sysctl -p
```

Error occurs when installing qpid

During the installation of IBM Cloud Manager with OpenStack or when deploying a cloud topology, you might encounter an error that the Qpid package did not install correctly.

Symptoms

During installation or when deploying a topology you might see an error similar to the following:

```
[2014-02-12T10:43:31-06:00] DEBUG: Chef::Exceptions::Exec: package[qpid-cpp-server]
(/var/chef/cache/cookbooks/qpid/providers/setup.rb line 15) had an error:
Chef::Exceptions::Exec:  returned 1, expected 0
```

Causes

A conflict might exist with Red Hat Enterprise Linux GNOME Desktop Environment (gnote), KDE Desktop Environment (Akonadi - the PIM Storage Service), or another external package that depends on version 1.41.0 of Boost C++ libraries.

Resolving the problem

To remove the conflict, identify and remove the conflicting package. Run the following command to identify any conflicting packages:

```
rpm -qa | grep -e "boost-.*-1\.41\.0.*" | xargs rpm --test -e
```

Then run the following command to remove any conflicting packages:

```
yum remove "package_name"
```

where *package_name* is the name of the conflicting package.

After any conflicting packages are removed, try the installation or deployment task again.

Installation fails when SSH is interrupted

When attempting to install IBM Cloud Manager with OpenStack on the deployment server, the installation fails and you are unable to uninstall the product.

Symptoms

You might see an error similar to the following message: `This Application has Unexpectedly Quit`.

Causes

InstallAnywhere cannot tolerate a Secure Shell (SSH) interruption. The results of the attempted installation are unpredictable. The installation is incomplete and the uninstall utility is unusable.

Resolving the problem

You must manually clean up the system.

1. Uninstall the Chef and Chef server RPMs if they were installed.
2. Delete the `/etc/chef` and `/etc/chef-server` directories if they exist.
3. Delete the `/root/.chef` directory if it exists.
4. Delete the `/opt/ibm/cmwo` directory.
5. Delete the `/var/..com.zerog.registry.xml` file if it exists. This file is the InstallAnywhere registry.
6. Trying running the installation again

SSL connection error occurs when certificate expires

An SSL connection error occurs due to an expired certificate.

Symptoms

You receive an SSL connection error.

Causes

The error can occur when your SSL certificate is expired.

Resolving the problem

Determine whether the certificate is expired. If it expired, you must delete the certificate and create a new certificate with a specific expiration date. To resolve the problem, complete the following steps:

1. Determine the name of your certificate by going to the following directory:

   ```
   /etc/pki/
   ```

   Run the following command:

   ```
   # certutil -L -d qpid/
   ```

   Check the output for the name of the certificate, for example, `qpidssl` or `openssl`.
2. Determine whether the certificate is expired by running the following command:

   ```
   # certutil -V -n certificate_name -u C -d qpid/
   ```

   where *certificate_name* is the name of your certificate.
3. Determine the expiration date of the certificate by running the following command:

   ```
    # certutil -L -d qpid/ -n certificate_name
   ```
4. Delete the expired certificate by running the following command:

   ```
    # certutil -D -d qpid/  qpid/cert.password -n certificate_name
   ```
5. Create a certificate by running the following command:

```
# certutil -S -d ./qpid/ -n certificate_name -s 'CN=certificate_name' -t 'CT,,' -x -v 10
-f ./qpid/cert.password -z /usr/bin/certutil
```

IBM Knowledge Center seems to cut off bottom of page

While you are browsing content about IBM Cloud Manager with OpenStack in IBM Knowledge Center, you encounter a page that seems to cut off part of the information at the bottom of the page.

Symptoms

You might see extra white space at the bottom of an IBM Knowledge Center topic that contains a table. The link to a parent topic might be missing.

Causes

The framework has a known issue.

Resolving the problem

Try displaying the content in a different web browser.

Using IPv6 and Python version 2.6

If you want to use the IPv6 management network and you are also using Python, version 2.6, you might need to patch Python with an update to version 2.6.

Symptoms

For example, you attempt to configure glance_api_servers in `nova.conf` to [2001:db8::22]:9696. You receive en error similar to the following output:

```
Traceback (most recent call last):
  File "<stdin>", line 1, in <module>
  File "urlparse.py", line 105, in port
    return int(port, 10)
ValueError: invalid literal for int() with base 10: 'db8::22]:9696'
```

Causes

The root cause of this problem is that the urlparse lib in Python 2.6 does not parse IPv6 URLs correctly.

Resolving the problem

To resolve this issue, you must patch the Python 2.6 code to successfully parse the IPv6 management network URL. Use the following instructions to patch Python.

1. For more information about the IPv6 URL parsing problem, see http://bugs.python.org/issue2987.
2. For more information about the fix patch for the bug, see http://bugs.python.org/file10451/python-urlparse-rfc2732-fix.patch.
3. Find the following code in `/usr/lib64/python2.6/urlparse.py`:

   ```
   @property
     def hostname(self):
         netloc = self.netloc
         if "@" in netloc:
             netloc = netloc.rsplit("@", 1)[1]
         if ":" in netloc:
             netloc = netloc.split(":", 1)[0]
         return netloc.lower() or None

     @property
     def port(self):
         netloc = self.netloc
         if "@" in netloc:
             netloc = netloc.rsplit("@", 1)[1]
         if ":" in netloc:
             port = netloc.split(":", 1)[1]
             return int(port, 10)
         return None
   ```

4. Change the bold lines in step 3 into:

```
@property
   def hostname(self):
       netloc = self.netloc
       if "@" in netloc:
           netloc = netloc.rsplit("@", 1)[1]
       if netloc and netloc[-1] != ']' and ":" in netloc:
                netloc = netloc.rsplit(":", 1)[0]
       return netloc.lower() or None

   @property
   def port(self):
       netloc = self.netloc
       if "@" in netloc:
           netloc = netloc.rsplit("@", 1)[1]
       if netloc and netloc[-1] != ']' and ":" in netloc:
               port = netloc.rsplit(":", 1)[1]
               return int(port, 10)
       return None
```

5. If you need to apply the fix to more than one system, you can generate a patch by completing the following steps:
   a. `cp /usr/lib64/python2.6/urlparse.py /usr/lib64/python2.6/urlparse.py.ori`
   b. Update `/usr/lib64/python2.6/urlparse.py` according to the previous steps.
   c. Generate the patch by using the following command: `diff /usr/lib64/python2.6/urlparse.py.ori /usr/lib64/python2.6/urlparse.py > urlparse.patch`
   d. Apply the patch on other system by using the following command: `patch /usr/lib64/python2.6/urlparse.py urlparse.patch`
6. After the code is changed or the patch is applied, clean up the pyc and pyo files for `urlparse.py`:
   ```
   rm /usr/lib64/python2.6/urlparse.pyc
   rm /usr/lib64/python2.6/urlparse.pyo
   ```
7. Restart the OpenStack services that are configured with IPv6 management network URLs.

Error viewing OpenStack resources with multiple regions (self-service portal)

After you deploy a topology that uses multiple regions with the IBM Cloud Manager with OpenStack self-service portal enabled, you see errors when you attempt to list OpenStack resources.

Symptoms

When you view OpenStack resources from the self-service portal, you encounter errors such as the following:

```
Failed to get the endpoint url of the volumes.
```

Causes

PKI tokens are being used for the authentication strategy and the tokens have become too large.

Resolving the problem

Switch the authentication strategy to uuid by setting this value in your chef environment file:

```
['openstack']['auth']['strategy'] = 'uuid'
```

Then redeploy the topology.

Error logs about failure to connect to messaging queue service

You might briefly see error logs about a failure to connect to the messaging queue service when OpenStack services start for the first time.

Symptoms

You might see errors similar to the error from `/var/log/nova/conductor.log` in the following example:

Note: Line breaks added in the following example for formatting purposes only.

```
2014-11-05 04:56:25.737 18393 ERROR oslo.messaging._drivers.impl_rabbit [-] Failed
to consume message from queue: 320: (CONNECTION_FORCED - broker forced connection
closure with reason 'shutdown', (0, 0), None)
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit Traceback
(most recent call last):
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr/
lib/python2.6/site-packages/oslo/messaging/_drivers/impl_rabbit.py", line 656, in ensure
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     return
method()
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr/
lib/python2.6/site-packages/oslo/messaging/_drivers/impl_rabbit.py", line 736, in _
consume
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     return
self.connection.drain_events(timeout=timeout)
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr
/lib/python2.6/site-packages/kombu/connection.py", line 280, in drain_events
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     return
self.transport.drain_events(self.connection, **kwargs)
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr/
lib/python2.6/site-packages/kombu/transport/pyamqp.py", line 91, in drain_events
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     return
connection.drain_events(**kwargs)
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr/
lib/python2.6/site-packages/amqp/connection.py", line 286, in drain_events
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     return
amqp_method(channel, args)
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit   File "/usr/
lib/python2.6/site-packages/amqp/connection.py", line 491, in _close
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit     raise
ConnectionError(reply_code, reply_text, (class_id, method_id))
2014-11-05 04:56:25.737 18393 TRACE oslo.messaging._drivers.impl_rabbit ConnectionError:
320: (CONNECTION_FORCED - broker forced connection closure with reason 'shutdown', (0,
0), None)
```

Similar error logs can be found in other OpenStack services.

Explanation

The reason is that the messaging queue service restarts three times during deployment, and the OpenStack services fail to connect when it is being restarted. The error disappears after the final restart completes. OpenStack functions are unaffected.

Resolution

You can ignore these log errors.

DB2 size increases when you use Ceilometer services

You notice that the size of your DB2 database quickly increases after you enable metering in a compute node.

Symptom

This problem can occur when you enable metering in a compute node by using the `compute_monitors = ComputeDriverCPUMonitor` setting in `nova.conf` and you are using the default configuration for your Ceilometer services.

Resolution

To resolve the problem, you must archive the database and remove unnecessary data by completing the following steps:

1. Stop all of the Ceilometer services by running the following command:

   ```
   /etc/init.d/service_name stop
   ```

   where *service_name* is the name of the Ceilometer service.

   Run the command on each of the following services:

   - openstack-ceilometer-alarm-evaluator
   - openstack-ceilometer-api
   - openstack-ceilometer-collector
   - openstack-ceilometer-alarm-notifier
   - openstack-ceilometer-central
   - openstack-ceilometer-notification
2. Stop the DB2 NoSQL service:

   ```
    /etc/init.d/db2.nosql.service stop
   ```
3. Back up the old database:

   ```
   su - db2inst1 -c 'db2 backup db ceilodb2 user ceilodb2user using ceilometer to /home/db2inst1/'
   ```

   where *ceilodb2* is the name of the Ceilometer database, *ceilodb2user* is the user name for the Ceilometer database, and *ceilometer* is the user password for the Ceilometer database.
4. Start the DB2 NoSQL service and remove unnecessary data by completing the following steps:

   Note: The following steps represent an *example* of DB2 NoSQL usage and removing unnecessary date. For detailed information about DB2 JSON databases and the DB2 JSON command-line interface, see JSON application development for IBM data servers and DB2 JSON capabilities, Part 2: Using the command-line processor.

   a. Start the DB2 NoSQL service:

   ```
    /etc/init.d/db2.nosql.service start
   ```

   b. Switch to the db2inst1 user:

   ```
   su - db2inst1
   ```

   c. Add the Java JDK to the PATH environment variable:

   ```
   export PATH=$PATH:/home/db2inst1/bin:/opt/ibm/db2/V10.5/java/jdk64/bin/
   ```

   d. Start the db2nosql command-line tool:

   ```
   cd  /opt/ibm/db2/V10.5/json/bin
   ./db2nosql.sh
   ```

   The following output is displayed:

   ```
   JSON Command Shell Setup and Launcher.
   This batch script assumes your JRE is 1.5 and higher. 1.6 will mask your password.
   Type db2nosql.sh -help to see options
   Enter DB:
   ```

   e. Enter the Ceilometer database name:

   ```
   ceilodb2
   ```

   where *ceilodb2* is the name of your Ceilometer database.

   The following output is displayed:

```
IBM DB2 NoSQL JSON API 1.1.0.0 build 1.3.44
Licensed Materials - Property of IBM
(c) Copyright IBM Corp. 2013 All Rights Reserve

nosql>Type your JSON query and hit <ENTER>
nosql>Type help() or help for usage information. All commands
are case sensitive.
nosql>
```

f. Enter the following command:

```
use ceilodb2
```

where *ceilodb2* is the name of your Ceilometer database.

The following output is displayed:

```
Switched to schema: CEILODB2
nosql>
```

g. Your DB2 configuration determines how many records you can delete at one time. If you delete too many records at one time, you might see memory errors in the DB2 transaction logs. You can limit the number of records to be deleted. In this example, 5,000 records are deleted at a time; you might be able to delete a larger number of records.

Determine the total number of records to be deleted:

```
nosql>db.meter.count()
```

The number of total records is displayed.

h. Determine the time stamp that can be used to delete the 5,000 oldest records:

```
nosql> db.meter.find().sort({timestamp : [1, "$date"]}).skip(5000).limit(1)
```

i. Delete the records:

```
nosql>db.meter.remove({"timestamp":{"$lte": {"$date":"2014-12-03T06:00:59.599Z"}}})
```

The number of records that are removed is displayed.

Note: If multiple records have the same time stamp, more than 5,000 records might be deleted.

j. Repeat the two previous steps to find and remove records until all of the old records are removed.

5. Restart all of the Ceilometer services:

```
/etc/init.d/service_name start
```

where *service_name* is the name of the Ceilometer service.

Run the command on each of the following services:

- openstack-ceilometer-collector
- openstack-ceilometer-alarm-notifier
- openstack-ceilometer-central
- openstack-ceilometer-notification
- openstack-ceilometer-alarm-evaluator
- openstack-ceilometer-api

Limitations

There are several known limitations with the current release of IBM Cloud Manager with OpenStack.

If your particular problem is not represented, see “Searching knowledge bases” on page 296 for a list of other references, particularly the Techdocs Web site, where more recent solutions or workarounds might instead reside.

IPv6 limitation with deployment

You can deploy the OpenStack components in an IPv6-supported environment and then, configure IPv6 on the OpenStack components.

However, due to limitations with InstallAnywhere and Chef, you cannot deploy an IPv6-configured OpenStack environment directly through the IBM Cloud Manager with OpenStack deployment process. Using the deployment process, you can install an IPv4 environment only.

Commands fail after DB2 restarted

You might experience problems when you run commands after the database is restarted.

Symptom

If the database (whether DB2 or mysql) is restarted, it is possible that the OpenStack command lines fail to return results, even after several attempts.

Resolution

Run the command again and it works after several attempts.

Cannot create images (Glance) with Unicode values

If you encounter issues when you create an image, ensure that you are not using Unicode property values.

There cannot be any Unicode property values within uploaded Glance images. The limitation also applies to any headers for an image request.

Messaging service limitation when deployment server and IBM Cloud Manager with OpenStack controller are on same server

You must use the Qpid messaging service if your deployment server and the IBM Cloud Manager with OpenStack controller are on the same server.

When the deployment server is on the same server as the IBM Cloud Manager with OpenStack controller, the controller cannot be restarted due to a port conflict after the operating system is restarted. This limitation occurs because the configuration file used by the `rabbitmq-server` in the deployment server and the configuration file that is deployed by IBM Cloud Manager with OpenStack are in the same location.

In this configuration, you must use the `qpid` messaging service.

Note: In addition, this configuration must be used for evaluation purposes only.

In IBM Cloud Manager with OpenStack version 4.2, the `rabbitmq` messaging service is the default. Therefore, you must switch from the RabbitMQ messaging service to the Qpid messaging service before you deploy IBM Cloud Manager with OpenStack. For instructions, see “Customizing the messaging service attributes” on page 123.

VLAN networks must have unique IDs

IBM Cloud Manager with OpenStack only supports VLAN networks that have different IDs.

With PowerVC, you can create different VLAN networks with the same VLAN ID. However, IBM Cloud Manager with OpenStack does not support this configuration. In this situation, IBM Cloud Manager with OpenStack only creates one VLAN.

Billing limitation with OpenStack Cinder service

In the IBM Cloud Manager with OpenStack self-service portal, there is a limitation when you use the Cinder service with the billing function.

Symptoms

Billing does not work with the volume configurable product if you use the Cinder service API, version 1.

Resolving the problem

If you want to use the billing function for volumes, you must use the Cinder service API, version 2.

Starting IBM Cloud Manager with OpenStack on a high scale cloud

When starting or restarting IBM Cloud Manager with OpenStack on a high scale cloud, the synchronization between IBM Cloud Manager with OpenStack and the cloud may take longer than expected. This resynchronization may cause operations such as deploying, deleting, or resizing an instance to be delayed or even fail. Wait for the synchronization to complete before attempting these actions.

Limitations when using VMware within the self-service portal

- The vCenter linked mode is not supported due to limited testing. You are responsible for any errors while you are using linked vCenters mode.
- The size of a virtual disk can be increased either at deployment time or through the IBM Cloud Manager with OpenStack self-service portal resize function. This increases the size of the disk, however, the guest file system is not changed and does not automatically use the increased size. To increase the guest file system to use the larger disk size, see the VMware documentation and guest operating system documentation.
- If your virtual system disks contain a Logical Volume Manager, then you must install VMware Tools inside the guest so that vCenter can customize the image during the deploy operation. For more information about LVM support, see the VMware documentation.
- All snapshots must be integrated before you create a template.
- Preferably, use shared storage for the hosts that are part of a cluster deployment target. If this is not possible, then remove hosts from the cluster while they are in maintenance mode. This prevents the default storage selection algorithm from selecting a data store that is only available from the host in maintenance mode. Selecting such a data store would cause a deployment to fail. For more information about the default storage selection algorithm, see “VMware datastore assignment during deployment” on page 179.

VMware capture instance:

The capture instance function is implemented using the VMware clone to template feature. The IBM Cloud Manager with OpenStack allows you to configure the optional properties in `vmware.properties` for controlling where the new template is created when a capture request is initiated:

`com.ibm.cfs.cloud.vmware.capture.image.datastore.names`
Datastore(s) used when capturing the image of an instance, for example when creating a template. This list is a series of datastore names separated by commas.

`com.ibm.cfs.cloud.vmware.capture.image.destination.name`
The destination host or cluster for where the new template will be placed.

`com.ibm.cfs.cloud.vmware.capture.image.destination.type`
The type of the destination for the new template, either HOST or CLUSTER.

`com.ibm.cfs.cloud.vmware.capture.image.folder`
The folder path for where to place the new template, for example, `. /DatacenterName/vm/FolderName`.

If these properties are not specified, the default behavior is to create the new template in the same location as the existing virtual machine.

VMware storage:

- When attaching a new storage volume in a cloud using VMware vCenter Server cloud, the space in assigned storage name will be ignored in the attached storage volume.

Include only ASCII characters in configuration files

When editing self-service portal configuration files, only use ASCII characters. If non-ASCII characters are used, the original characters are not preserved and display as garbled text in the IBM Cloud Manager with OpenStack self-service portal user interface. The configuration files include all the *.properties* files in the home directory.

Disk resize support

In a Shared Storage Pool environment, changing the disk size when deploying is not supported. In addition, when deploying an IBM i workload, disk resize is not available. In these cases, the disk size property is not displayed in the output of `POST /cloud/api/workload` and the disk resize field is not displayed on the Advanced deployment window.

Limitation when you use characters other than printable ASCII characters

Limitations apply when you use characters that are not printable ASCII characters for IBM Cloud Manager with OpenStack operations. You must use only printable ASCII characters because Python 2.X supports only printable ASCII characters.

Examples:

- You use Chinese characters to try to create, edit, or update a volume. You receive a warning that indicates that there are too many characters, or you receive an error that states that the operation cannot complete. Try the operation again, but ensure that you use printable ASCII characters instead of Chinese characters.
- You might encounter a problem when you run the following command:

  ```
  cinder list --display-name display-name
  ```

  when *display-name* is composed of characters that are not printable ASCII characters. Ensure that you use printable ASCII characters for *display-name*.
- When you install IBM Cloud Manager with OpenStack, the path to the installer must contain only printable ASCII characters.

Unable to restore a virtual server with fixed VHD type

When a virtual server is deployed by using an image with a fixed VHD type on Hyper-V, that virtual server cannot be successfully restored after a backup.

The limitation is due to the following error condition:

```
CYX6161E: An error occurred at '2013-05-06T21:05:04Z' for virtual machine with identifier
'fd319c6e-91e9-4350-b896-9fdcd3236282'. The error code is '500'. The detailed error is:
ImageTooLarge - Image is larger than instance type allows
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\compute\manager.py", line 230, in decorated_function
return function(self, context, *args, **kwargs)
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\compute\manager.py", line 1230, in run_instance
do_run_instance()
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\openstack\common\lockutils.py", line 242, in inner
retval = f(*args, **kwargs)
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\compute\manager.py", line 1229, in do_run_instance
admin_password, is_first_time, node, instance)
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
```

```
nova\compute\manager.py", line 877, in _run_instanceself._set_instance_error_state(context,
instance['uuid'])
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\contextlib.py",
line 24, in __exit__
self.gen.next()
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\compute\manager.py",
line 798, in _run_instance
image_meta = self._check_image_size(context, instance)
File "C:\Program Files (x86)\IBM\SmartCloud Entry\Hyper-V Agent\Python27\lib\site-packages\
nova\compute\manager.py", line 1040, in _check_image_size
raise exception.ImageTooLarge()
Instance could no longer be found in the Cloud.
It could have been purposely deleted from the Cloud.
```

This issue is tracked at https://bugs.launchpad.net/nova/+bug/1177927.

Validation errors when updating a configuration strategy

When you update the configuration strategy for an image, all fields on the page are validated after you select a local file for the template, user metadata, or mapping. If any of the fields are not valid, an error message displays. Error messages display even if you have not yet provided a value for a required field, such as the mapping field. Proceed by specifying the required fields.

Problem choosing correct datastore during concurrent deployments (VMware vCenter)

The IBM Cloud Manager with OpenStack self-service portal is unable to choose the correct target datastore if VMware vCenter does not provide real-time datastore usage information.

VMware vCenter does not refresh the data of datastore usage before cloning is completed. When you run concurrent deployments, if VMware vCenter cannot provide real-time datastore usage, IBM Cloud Manager with OpenStack self-service portal cannot decide the correct target datastore under concurrent deployment scenario. As a result, the datastore is not enough when the concurrent deployments need a total datastore resource that is bigger than the datastore nodes left. With insufficient resources, deployments fail as the resources do not meet the minimum amounts. The self-service portal tries to suggest other datastore nodes. It attempts three times, by default. If you want to configure a value greater than three, open the `vmware.properties` file and add the following line: **`"com.ibm.vmware.client.clone.retry.attempts=5"`**, for example.

The failed virtual machine sends a log to the self-service portal interface, as follows:

```
The following instance logs were found in the Cloud. CYX0886E: Unable to determine if the deployed
virtual machine '*' is started and ready for use in the allotted time of 2,700 seconds.
The deployed virtual machine may still be starting or may have had customization problems.
Check the log and the virtual machine for more information.
If the virtual machine was started and is ready for use,
increase the wait time in the vmware.properties file."
```

XFS dependency packages required for Swift

If you want to use Swift on an IBM Power system or System z system that is running IBM Cloud Manager with OpenStack, you must first manually install several XFS file system packages.

Symptoms

Before you can use Swift with IBM Cloud Manager with OpenStack on an IBM Power system or System z system, you must locate and install several XFS file system packages.

Resolving the problem

The XFS packages that are required to run Swift on an IBM Power system or System z system with IBM Cloud Manager with OpenStack are included in the following list:

- xfsdump
- xfsprogs-devel

- xfsprogs

Locate and install these XFS file system packages before attempting to run Swift on an IBM Power system or System z system with IBM Cloud Manager with OpenStack.

Migration information not available

You cannot find instructions for migrating from IBM SmartCloud Entry, version 3.2 to IBM Cloud Manager with OpenStack, version 4.2.

Symptoms

You are not able to locate instructions for migrating from IBM SmartCloud Entry, version 3.2 to IBM Cloud Manager with OpenStack, version 4.2.

Causes

Instructions for migrating from IBM SmartCloud Entry, version 3.2 to IBM Cloud Manager with OpenStack, version 4.2 are not available at this time.

Known problems and solutions for a User

If you are using IBM Cloud Manager with OpenStack with the *User* role, review theses known problems and solutions that you might encounter.

Cached display

When you install or upgrade to IBM Cloud Manager with OpenStack, your browser might not update the images from a previous version of the software.

Be sure to clear your browser's cache after you upgrade to, or install, IBM Cloud Manager with OpenStack.

Saving image exception

If the virtual machine is not created by the current IBM Cloud Manager with OpenStack, you receive an error message when you save an image backup of the virtual machine.

IBM Cloud Manager with OpenStack requires the details of the virtual machine to create an image backup. If this error occurs, you receive the following message:

```
CYX4755E: Instance "instance name" does not have a customization and its virtual machine cannot be saved.
```

Note: *Instance name* is the name of the instance that contains the virtual machine.

Error message language

Some error messages appear in a language other than the language that you set for the IBM Cloud Manager with OpenStack user interface.

These error messages appear in the language set in your operating system. If the error message does not appear in the language that you want, verify your settings in both the IBM Cloud Manager with OpenStack user interface and the operating system.

Internet Explorer display

When you are using IBM Cloud Manager with OpenStack in Internet Explorer 9, 10, or Internet Explorer 11, you might see that layout and formatting makes the screen difficult to navigate.

When you are accessing IBM Cloud Manager with OpenStack with Internet Explorer 9, 10, or Internet Explorer 11, the browser might render the web user interface in Compatibility View mode by default.

Switch from Internet Explorer Compatibility View mode to the standard mode with the following steps:

1. To switch from Compatibility View mode to the standard mode, click the Compatibility View button, which is located on the right side of the address bar (highlighted in green in the following image).

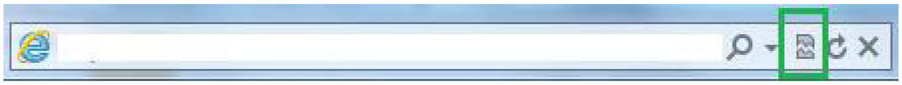
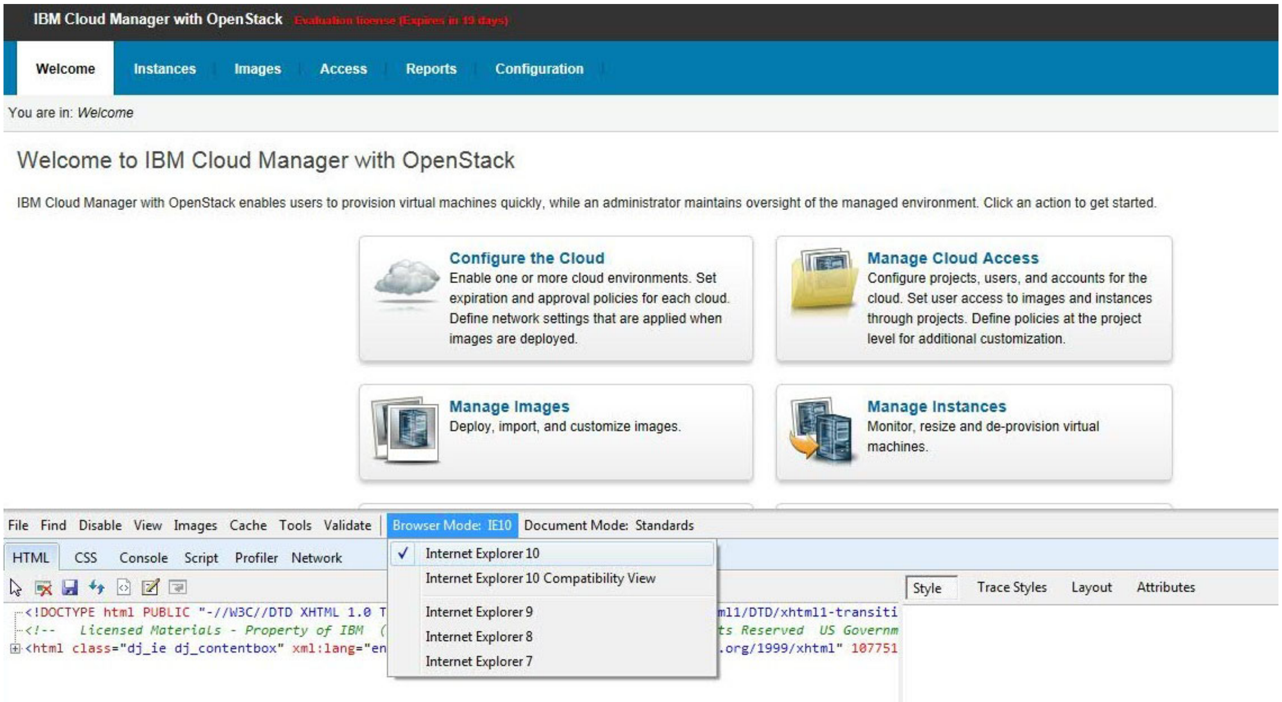


Figure 4. Compatibility button

2. If the Compatibility View button is not visible, press F12.
3. Depending on which version of Internet Explorer you are using, continue with one set of the following steps:
   - If you are using Internet Explorer 9, click **Browser Mode: IE9** > **Internet Explorer 9** to select the standard mode of viewing. Notice that the only check mark in the menu is in front of **Internet Explorer 9**.
   - If you are using Internet Explorer 10, click **Browser Mode: IE10** > **Internet Explorer 10** to select the standard mode of viewing. Notice that the only check mark in the menu is in front of **Internet Explorer 10**.



IBM Cloud Manager with OpenStack Evaluation license (Expires in 19 days)

You are in: *Welcome*

Welcome to IBM Cloud Manager with OpenStack

IBM Cloud Manager with OpenStack enables users to provision virtual machines quickly, while an administrator maintains oversight of the managed environment. Click an action to get started.

Configure the Cloud
Enable one or more cloud environments. Set expiration and approval policies for each cloud. Define network settings that are applied when images are deployed.

Manage Cloud Access
Configure projects, users, and accounts for the cloud. Set user access to images and instances through projects. Define policies at the project level for additional customization.

Manage Images
Deploy, import, and customize images.

Manage Instances
Monitor, resize and de-provision virtual machines.

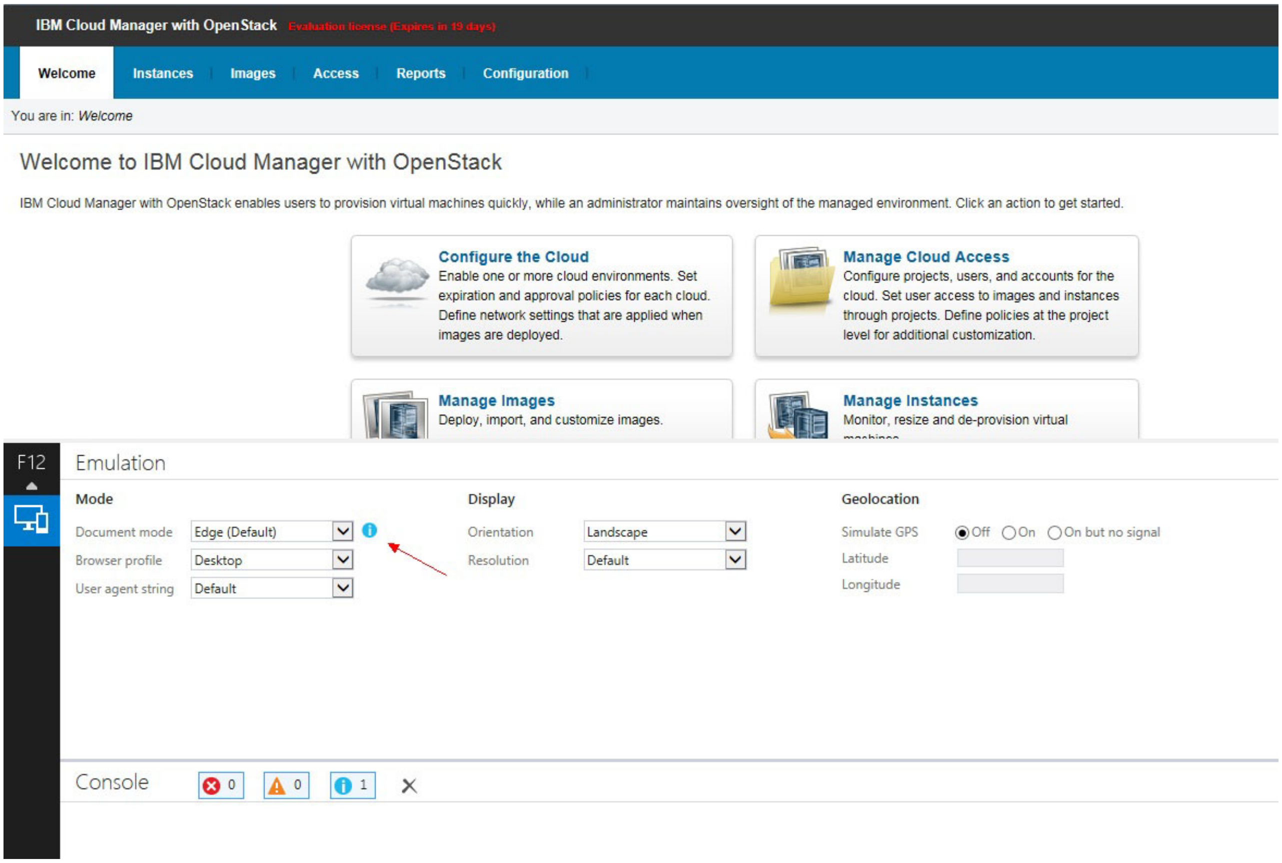
Browser Mode: IE10 Document Mode: Standards

✓ Internet Explorer 10
Internet Explorer 10 Compatibility View
Internet Explorer 9
Internet Explorer 8
Internet Explorer 7

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 T    ml1/DTD/xhtml1-transiti
<!--   Licensed Materials - Property of IBM  (    ts Reserved  US Governm
<html class="dj_ie dj_contentbox" xml:lang="en    .org/1999/xhtml" 107751
```

Figure 5. Browser Mode: IE10 menu

   - If you are using Internet Explorer 11, click **Document Mode** to select the standard mode of viewing.



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Manage Images
Deploy, import, and customize images.

Manage Instances
Monitor, resize and de-provision virtual

Mode
Document mode: Edge (Default)
Browser profile: Desktop
User agent string: Default

Display
Orientation: Landscape
Resolution: Default

Geolocation
Simulate GPS: ● Off ○ On ○ On but no signal
Latitude
Longitude

Figure 6. Browser Mode: IE11 menu

Tip: If Internet Explorer, which is accessing IBM Cloud Manager with OpenStack, switches from standard mode to Compatibility View mode automatically, clear the option in **Tools** > **Internet options** > **Advanced** > **Automatically recover from page layout errors with Compatibility View**.

Login fails

If your user login fails because the session times out, there might be a problem with the timezone setting.

Check the following possible resolutions.

- Verify that the IBM Cloud Manager with OpenStack server and client time and timezone match. For example, on the server, if the timezone is Coordinated Universal Time +08:00, the time is 11:27. For the client, the timezone is Coordinated Universal Time +07:00, and the time should be 10:27.

  Note: The client is the clock for the system where the IBM Cloud Manager with OpenStack user interface is being run (such as a personal computer).
- Verify that the user is not locked. The administrator can lock and unlock user accounts from the self-service portal. If a user is locked out, that person cannot log in. If the default administrator account is locked, it unlocks when the server is restarted.

Accessibility

IBM Cloud Manager with OpenStack does not interfere with the accessibility features for supported browsers. For a comprehensive list of accessibility features please visit the accessibility support page for the supported browser that you are using. For a list of supported browsers, see Supported web browsers.

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